No. 16.

ANNUAL REPORT

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

ORGANIZED 1886. INCORPORATED 1892.

TORONTO

1901.

The next Annual Meeting will be held at Toronto on Tuesday, Feb. 25th and following days.

PRINTED FOR THE ASSOCIATION BY
HENDERSON & CO., LOMBARD STREET,
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OUR LATE BELOVED QUEEN.

BORN MAY 24th, 1819. DIED JANUARY 22nd, 1901.
AGED 81 YEARS.

This was her Majesty's most recent portrait, and was taken at her special command by Lafayette. She is shown wearing the shamrock in her bonnet.

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No. 16.

ANNUAL REPORT

OF THE

ASSOCIATION

OF

Ontario Land Surveyors

ORGANIZED 1886. INCORPORATED 1892.

AND

PROCEEDINGS

AT THE

NINTH ANNUAL MEETING

SINCE INCORPORATION

HELD AT

TORONTO

26th, 27th and 28th February, 1901.

PRINTED FOR THE ASSOCIATION BY
HENDERSON & CO., LOMBARD STREET,
TORONTO.

PATRONIZE OUR ADVERTISERS.

NOTICES.

Members and others will be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896. 1897, 1898, 1899, or 1900, upon remitting to the Secretary fifty cents, for each copy required.

Copies of the "Manual" may also be had from the Secretary, price fifty cents.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme is most desirable, and to insure its preparation it is not now too early to bear the matter in mind.

In addition to its use as a library, the Repository now serves as a drafting room for members when copying Crown Lands plans and notes.

Published annually by the Association of Ontario Land Surveyors. Edition, 1350 copies; price, 50 cents.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors:

The Proceedings of the Association at its Ninth Annual Meeting are herewith presented.

There are no additions to the "Manual" this year, but at page 197 will be found the Regulations, etc., relating to the admission of Land Surveyors, which will be found convenient.

Respectfully submitted on behalf of the council.

VILLIERS SANKEY,
Secretary.

317958

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ASSOCIATION OF

ONTARIO LAND SURVEYORS

(INCORPORATED 1892)

Organized 23rd February, 1886.

OFFICERS FOR 1901-1902.

PRESIDENT.

JAMES DICKSON, - - - - - - - - Fenelon Falls.

VICE-PRESIDENT.

W. R. AYLSWORTH, - - - - - - - Belleville.

CHAIRMAN OF COUNCIL.

GEORGE B. KIRKPATRICK, O.L.S., - - - - - Toronto.

SECRETARY-TREASURER.

MAJOR VILLIERS SANKEY, O.L.S., - - - - - Toronto.

MEMBERS OF COUNCIL.

J. W. TYRRELL, Hamilton.
J. MCARCE, Rat Portage. } For Term ending April, 1904.

A. J. VANNOSTRAND, Toronto.
C. A. JONES, Petrolea. } For Term ending April, 1903.

G. B KIRKPATRICK, Toronto.
A. NIVEN, Haliburton, } For Term ending April, 1902.

AUDITORS.

CAPT. GAMBLE, - - - - - - - - - Toronto.
A. J. VANNOSTRAND, - - - - - - - - Toronto.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch), Toronto.

31475

BOARD OF EXAMINERS.

G. B. Kirkpatrick, (Chairman), A. Niven, P. S. Gibson, M. Gaviller, B. J. Saunders, M. J. Butter, V. Sankey, (Sec.)

NOTE—Board meets at Crown Lands Department, Parliament Buildings, Toronto, on Monday, February 10th, 1902.

COMMITTEES, 1901-1902.

STANDING.

LAND SURVEYING—J. D. Evans, (Chairman). H. S. Carpenter, A. R. Davis, R. W. DeMorest, M. Gaviller, H. H. Gibson, A. Niven, A. S. Russell.

DRAINAGE—C. A. Jones, (Chairman), F. W. Farncomb, F. W. Hater, W. G. McGeorge, J. H. Moore, Geo. Ross.

ENGINEERING—E. G. Barrow, (Chairman), A. W. Campbell, Jas. Hutcheon, R. McDowall, F. F. Miller, A. P. Walker, Jas. Warren.

ENTERTAINMENT—A. P. Walker, (Chairman), Willis Chipman, H. L. Esten, H. H. Gibson, H. DeQ. Sewell, V. Sankey, J. F. Whitson.

PUBLICATION—K. Gamble, (Chairman), H. J. Browne, H. L. Esten, W. A. MacLean, A. J. Van Nostrand.

TOPOGRAPHICAL SURVEY—L. B. Stewart, (Chairman), Otto J. Klotz, M. J. Butler, Willis Chipman.

SPECIAL.

POLAR RESEARCH—Willis Chipman, (Chairman), Jos. Cozens, C. J. Murphy, Wm. Ogilvie, L. B. Stewart, J. W. Tyrrell, J. F. Whitson.

EXPLORATION—J. W. Tyrrell, (Chairman), Alex. Baird, D. Beatty, John McAree, Jas. Robertson, G. E. Silvester, T. B. Speight, E. Stewart.

REPOSITORY AND BIOGRAPHY—A. J. Van Nostrand, (Chairman), Willis Chipman, R. P. Fairbairn, P. S. Gibson, T. H. Jones, G. B. Kirkpatrick, C. Unwin.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED.)

AT ITS NINTH ANNUAL MEETING HELD AT TORONTO.

26th, 27th AND 28th FEBRUARY, 1901.

PROGRAMME.

Tuesday, 26th February—Morning, 10 oclock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon, 2 o'clock.

President's Address.
Report of Secretary-Treasurer.
Report of Committee on Repository and Biography. A. J. Van Nostrand, Chairman.
Report of Committee on Publication. K. Gamble, Chairman.

Evening, 8 o'clock.

(At Repository)

Paper—"Engineers and Surveyors." A. R. Davis.

Wednesday, 27th February—Morning, 10 o'clock.

AT ENGINEERS' CLUB ROOMS, 94 AND 96 KING ST. WEST.

Report of Council. G. B. Kirkpatrick, Chairman.
Paper—"Surveys and Plans for Municipalities." H. J. Bowman.
Discussion—"Duties of Surveyors as Referees."
Report of Land Surveying Committee and Question Drawer. W. R. Aylsworth Chairman.

Afternoon, 2 o'clock.

"Regulation of the Level of Lake Erie." F. W. Farncomb.
Report of Drainage Committee and Question Drawer. A. S. Code, Chairman.
Discussion—"Reclamation of Lands under the Several Drainage Acts."
Report of Engineering Committee. M. J. Butler, Chairman.
Report *re* Standard of Measure. V. Sankey.

Evening, 8 o'clock.

Annual Dinner. McConkey's Restaurant.

Thursday, 28th February—Morning, 10 o'clock.

at engineers' club rooms, 94 and 96 king st. west.

Report of Topographical Suvrey Committee. Otto J. Klotz.
Paper—"Topographic Photography." J. N. Wallace.
Discussion—"Track Surveying."
Report of Exploration Committee, "Digest Northern Ontario Explorations." L. B. Stewart, Chairman.
Report of Committee on Entertainment. H. L. Esten, Chairman.

Afternoon, 2 o'clock.

Nomination of Officers—(President, Vice-President, Secretary-Treasurer, Auditors, two members of Council.
Ratification of By-Laws.
Unfinished Business.
New Business.
Adjournment.

Minutes of the Ninth Annual Meeting

OF THE

ASSOCIATION OF

ONTARIO LAND SURVEYORS,

Held at the Repository, Parliament Buildings, Toronto, on FEBRUARY 26th, and at the Engineers' Club Rooms, 94 and 96 King Street East, Toronto, on FEBRUARY 27th and 28th.

Morning Session.

Meeting of the Standing and Special Committees.

Repository, February 26th, 1901.

The Ninth Annual Meeting opened at 3 p.m., the President, Mr. Ross, in the chair.

The Minutes of the previous meeting as printed in the Proceedings for 1900 were taken as read.

The President then read his address, in which he fittingly referred to the death of Her late Majesty Queen Victoria. After some discussion it was moved by Mr. Aylesworth, seconded by Mr. Kirkpatrick, that the address be received and printed in the Proceedings. Carried.

Mr. Kirkpatrick, referring to the death of Her late Majesty requested the Chairman to name a Committee to draft an address of condolence to His Majesty King Edward the Seventh, to be forwarded through the proper channel, that it may be laid at the foot of the throne.

The Chairman named Messrs. Kirkpatrick, Dickson and Aylesworth. Carried.

The report of the Committee on Repository and Biography was presented by Mr. A. J. Van Nostrand, and on motion, was received and ordered to be printed.

The report of the Committee on Publication was presented by Capt. Gamble, and on motion, was received and ordered to be printed.

Mr. Sankey brought up the subject of the preparation of papers for the Annual Meeting. After some discussion it was decided to request the Chairmen of the several Committees, to take up the matter early in the year, and communicate with those members most likely to contribute.

The meeting adjourned until 8 p.m. at the Repository.

Evening Session.

Tuesday, 26th, February 1901, 8 o'clock p.m.

Mr. George Ross, President.

Mr. Villiers Sankey, Secretary.

Paper by Mr. A. R. Davis (Napanee), entitled "Engineers and Surveyors."

Mr. Davis:—Mr. President and gentlemen: The object of this paper is to assist in paving the way for the closer union of our civil engineers and surveyors. For the sake of the argument I suggest to the meeting, "The Canadian Association of Civil Engineers and Surveyors," with a question mark. Reads paper.

The President then tendered the thanks of the Association to Mr. Davis for his very valuable contribution.

Mr. Davis:—I thank you, Mr. President and Gentlemen, for the kind reception you have given the paper. It was practically a new field for me to travel, and I wrote to two or three members of this Association, for some hints in reference to the matter, men who I knew knew more about the matter pertaining to the union of the two professions than I did. But I found that "mum" was the word. I got no replies. Then I took the course that I thought looked most reasonable, and while giving vent to certain thoughts, in reference to this question, that have been prominent in my mind for a number of years, I endeavored as far as possible to avoid the extremes that sometimes injure the cause more than they help it.

I am very much pleased with the very fair and excellent feeling that prevails among the members of the Association in reference to this amalgamation. There is no question that we (Surveyors and Engineers) are practically members of the same profession. In my experience as a Surveyor and Civil Engineer I am running across every year Surveyors and Engineers from

the Atlantic to the Pacific—I meet them in the Maritime Provinces and in all the other Provinces. I will give you one illustration of the feeling that exists: During last summer while on Railway Work I came into the camp of a Surveyor belonging to one of our neighboring Provinces, in the employ of a rival Railway Company—my camp was near his, and we were both aiming for the same pass between the mountains; in fact his Company had located its line, and this Surveyor was taking some right-of-way notes—he was a stranger to me, a man I had never seen before. I called him by name, passed the time of day, and said, That I came to see him in regard to their location as I wished to avoid crossing it; I thought there was room enough in the country for both of us; and I asked him if he would kindly give me some information. He invited me into his camp; and got out his plan of location, and said, "Here, take this and make a copy of it; you can do it over in your own camp—here is our location." I said, "This is very kind of you; there is no indication of any bitterness towards the employes of your rivals." "Oh," said he, "That is all right; if the heads of our companies require to get at logger-heads, well and good; we men in the field cannot afford to dispute over these matters, we have enough troubles of our own." He treated me very kindly and invited me over to dinner the next day, and we had a sociable time. Such are the men we are meeting as Surveyors and Engineers, a common brotherhood from the Atlantic to the Pacific; and they are as intelligent men as you can meet anywhere in this Dominion to-day; and yet they are apart, they are separate; there is a line of cleavage running all along, although this is a new country, as Mr. Chipman says, and there are only a few men employed in the profession. The rising generation, the young men who are entering the profession can be qualified for whatever work we have to do; and the examinations can be made such as to meet the requirements, all can meet on common ground, and we will strengthen ourselves and strengthen the calling; and make ourselves a name that will be honored throughout the Dominion, and as with all other professions, the standard of our profession will be raised and we will not suffer. We should not lower our standard but rather elevate it; and certainly consolidation will have a tendency to elevate, if it be carried out on right principles. (Applause).

Moved by Mr. Sankey, seconded by Mr. Bowman that the new council shall appoint a Committee to be known as the

"Legislation Committee," to take up matters concerning amalgamation of the Surveyors and Engineers, or as the case may be.

The President put the motion, and, on a vote having been taken, declared it carried.

A Paper by Mr. Klotz on the Deflection of the Plumb Line.

Mr. Sankey:—There are two plans connected with this paper, and I think if I pass them round so that they may be seen the paper which I am about to read will be more easily understood. Mr. Klotz sent this printed copy of the paper to the Association; he has already read the paper before the Ottawa Literary and Scientific Society, and I took it upon myself to write, asking him if he had any objection to the paper being read before this Association and published in our proceedings, as it seemed to be one of very great interest to Surveyors in general. I got a very nice letter from him, saying he would be very much pleased, and very proud if we would do him the honor of reading his paper and publishing it in our proceedings.

Mr. Sankey reads the paper.

Mr. Aylesworth moved, seconded by Mr. Davis that the paper as read be received and published in the Minutes of our Proceedings and that a vote of thanks be tendered to Mr. Klotz.

The President put the motion, and, on a vote having been taken declared it carried.

Adjourned to Wednesday, 27th February, 1901, at 10 o'clock a.m., at the Engineers Club, 94-96 King St., West, Toronto.

Morning Session.

Wednesday, 27th February, 1901, 10 a.m., at the Engineers Club, 94-96 King Street, West.

The President called the meeting to order.

Report re Standard of Measure.

Mr. Sankey:—Mr. President and Gentlemen, the object I have in making this a verbal report rather than bringing it in in connection with the official reports is, that it would be well now for us to consider if any other suggestions should be made with

regard to our standard tape. In the report of last year's Proceedings the matter is dealt with as it was discussed; and at the end of the discussion is was moved by Mr. Aylesworth and seconded by Mr. Ross, that the Board of Examiners be recommended to adopt a 33-foot steel tape as the standard of measurement to be given in future to those who pass the final examination. The President added the suggestion that a sufficient number might be purchased to allow the older members to get them at a nominal figure and hoped that they would be able to do so. Mr. Wilkie said, "For myself I should be very glad to purchase one, and I think with Mr. Sankey that the 33-foot would be the most suitable. I do not anticipate any trouble in comparing the length of my 100-foot chain with the 33-foot standard." Following that instruction out, immediately after the last annual meeting, I opened communications with the various manufacturers of steel tapes through their agents or representatives in Toronto. After a good deal of correspondence we found that Chesterman would not make anything out of the ordinary run of tapes he was making. He would sell us 50-foot or 33-foot tapes, just as he had them in stock. And some of the manufacturers in the United States took the same position. Finally the Lufkin Rule Company of Saginaw stated that they would make a tape according to our pattern if we would order one hundred of them. We found on enquiry that the tapes would cost about $4 apiece. We have not yet ascertained whether we can get them in free of duty, or not. Neither Mr. Kirkpatrick, the Chairman of the Council, nor I, felt justified in giving an order that would entail the expenditure of so much money; but we said we would guarantee an order of $100 worth of tapes, and undertake to make this tape the Association standard, that is, we would not go anywhere else to get them made. On that understanding, the Lufkin Rule Company have sent me this tape which I have in my hand as a pattern; it is made on the design that was furnished to me. Now that you have the tape stretched out, you will see that on the face, at the front end the foot is divided into inches, 8ths and 16ths, with the half inch divided further on. There is one improvement I suggest, and that is to get the zero taken out, so that the graduations would be perfectly clear. On the other side of the tape, the link is divided into 10ths and 100ths, merely. Then, we have our own stamp on it, "O.L.S. Standard." At the box end of the tape, the foot is divided into 10ths and 100ths. These tapes will cost $4 net.

There is one advantage with regard to the 33-foot length; it cannot be very well used to make a survey, and it is not intended for that purpose; it will also test the 33-foot and 50-foot link tape at the same time, as they are coincident at the end of the proposed tape.

In order to see how we could get a proper standard, from our Canadian standpoint, the manufacturers sent a sample to Ottawa some time in August last, to get a proper comparison of this tape with the Dominion Land Standard, or really the Department of the Interior Standard, but their mural Standard is broken down, and they cannot compare a tape so long as 33-feet. For that reason I am not able to issue any tapes as yet, and will not be able to do so until we get them stamped so that they will be official for Canada.

Mr. Sewell:—Is it the intention to have the Dominion stamp on them also, so that they will apply as standards for Ontario and the Dominion ?

Mr. Sankey:—Yes; so that it cannot be said that the Ontario Land Surveyors' tapes are not standard with the Standard of the Inland Revenue Department.

In making the change from our old rooms to the new ones, I happened to strike a bundle of papers that were without endorsement, and on looking into the bundle I found what I had been looking for for a long while; and it would be interesting to read these letters, in order that they may be published. You will remember that yesterday evening at the meeting I had the bronze bar which is the original standard of the Ontario Land Surveyors, and has been in the possession of the various Commissioners of Crown Lands for many years.

The first letter I will read is from Troughton & Sims, of Fleet Street, London, written to Mr. W. H. Price, Esquire, Crown Lands, Toronto, Canada, and is dated 14th September, 1850, and reads as follows:—

138 Fleet Street, London, 14th Sept., 1850.

SIR,

We forwarded by the "Mississippi" which sailed on the 20th ult. for New York, a case containing the two Scales for which we were favored with your order by letters of the 18th and 22nd of April last.

The case was addressed to the care of Mr. S. R. Kelly, Commission Merchant, Wall Street, New York, and we hope the Scales will reach you in safety and prove satisfactory.

The Standard Yard was carefully compared with the Tabular Standard Scale of the Royal Astronomical Society and the result of the comparison makes it .oc008 of an inch longer than the middle 3 feet, or Standard Yard upon that Scale.

Many years ago Mr. Edward Troughton, for insertion in Dr. Kelly's Cambist, compared a number of foreign with our English measure and amongst the rest an old French Foot, which he found equal to 12.7893 English Inches. Now according to this determination, the Scale of 3 French feet should measure 38.3679 inches upon the Royal Astronomical Society's Scale, and we have satisfaction in reporting that our comparisons make it exceed that length by $\frac{1}{2500}$ of an inch only.

The temperature at which the comparisons were made was between 64° and 66° of Fahrenheit's Thermometor, but as all the Scales are made of brass this is of little or no consequence.

We remain, Sir,

Your most obedient servant,

TROUGHTON & SIMMS.

Mr. Sankey:—That shows that this bar of ours was properly compared in England.

In 1875 a considerable correspondence took place between the Commissioner of Crown Lands in Ontario and the Commissioner of Inland Revenue in Ottawa on the subject of having our Ontario Tapes properly stamped. That correspondence is probably not very interesting to us; it goes into the question as to whether the Dominion held entire control of measures which nobody of course now contradicts. There is a letter here of September 17th, 1877, written by Mr. A. W. Brunell, Commissioner, that I think is most important; it is as follows:—

OTTAWA, September, 19th, 1877.

SIR,

1. Having completed the verification of your standard bar it was delivered to Mr. Murphy on Monday and I have now the pleasure to enclose an indenture of the verification.

2. You will observe that your bar is somewhat short of the standard length but the error is so small as to be of no importance in relation to its practical use.

3. Nevertheless I think it is desirable that all measures used as standards of comparison should have their exact value strictly defined. I have therefore taken considerable trouble in defining the exact value of this particular standard which is perhaps the most important of any lineal standard used in the Province of Ontario.

4. I may observe that the defining lines on your bar as compared with those on the Dominion Standard are so coarse

that it became necessary to measure their breadth and on doing so I discovered a measurable difference between the two defining lines. This difference is equal to .00057559 inch and I have therefore computed the length of the bar to the centre of the defining lines.

5. I am very glad to have had the opportunity of making these comparisons and shall endeavor to obtain similar comparisons of the Surveyor's Standards used in the other Provinces.

I have the honor to be, Sir,

Your obedient servant.

A. W. BRUNEL, *Commissioner.*

In view of these letters and the fact that the mural Standard at Ottawa is broken down, the Board of Examiners suggested that we should find out from Mr. Stewart of the School of Science whether they have any instrument there from which this comparison could be made by us; and he tells me there will be no difficulty at all in comparing our bronze standard with a 33-foot tape, the idea being that the Secretary of the Board shall keep that tape as a standard in his possession, with the record of its length made on the comparator up at the School of Science. Then every tape that is issued is to be compared with that 33-foot steel tape and stamped accordingly. We will stamp on the face of the tape our own Ontario Land Surveyors' mark; and each tape will be numbered so that a record may be kept of those to whom the tapes are issued.

The Council suggested that the next step to be taken would be for the Commissioner of Crown Lands to get authority from the Dominion Government for the Secretary of the Board of Examiners to be an inspector for the purpose of marking Ontario Land Surveyors' tapes, now that we are in actual possession of a properly compared standard.

These I think are the principal points that I was going to put in my paper which I did not expect to have to read until this afternoon; but as Captain Bernier is to lecture before the meeting it was thought well to bring the matter up at this morning's Session. If there are any suggestions to be made as to the marking of the tape or otherwise I would be very glad to get them.

Mr. Dickson:—I think stamping the certificate on the tape is a good idea. At present if a certificate is lost the owner of the tape has nothing to show that there was a certificate with it; the number even is not on the tapes now.

Mr. Sankey:—Mr. Unwin, the late partner of Messrs. Murphy & Esten, had the Dominion Standard with a certificate; and Messrs. Esten & Murphy found they would have to get the tape re-registered in their own names before it would be official for them to use it for Dominion Lands work. I suppose from that that there was some method of marking the tape. The idea I had in my mind was to etch a number on the tape, somewhere near the front of it, and open a register which would show, for instance, that Mr. James Dickson got tape No. so and so on such a day; but I did not propose to issue any tape that fell short of or was longer than the stamped standard; of course it would be utterly impossible for us to give a certificate that any tape like this was .006 long at a temperature of 40 degrees, or anything of that kind.

Mr. McDowall:—Who would be allowed to manufacture these tapes ?

Mr. Sankey:—These tapes, which will be the standard, will be manufactured by the Lufkin Rule Company; they will be issued to Surveyors to test any other tapes or chains they want to use, in the same way as they are supposed to use the old wooden stick.

Mr. McDowall:—Did you say "supposed ?"

Mr. Sankey:—I did say "supposed." The only use I have ever seen those old sticks put to was to put through a strap on a theodolite box to help a man to carry it along through the bush.

Mr. McDowall:—Do you think in the life time of that tape we might have the metric system in force.

Mr. Sankey:—I do not know about that. There is quite a movement in Toronto to bring about the adoption of it; but I have heard some practical men, both Engineers and Surveyors, say that they did not at present see how either Great Britain or the United States can spend money necessary to alter every machine process that is used in the United States and England; because all the screw cutting machinery of those two great countries would have to be thrown into the waste heap. Whether the change to the metric system will come about in our day or not I do not know.

Some years ago, when it was being discussed, I addressed this meeting on the idea of using decimal measures altogether and doing away with inches and the division of the inches into 8ths, using instead 10ths and 100ths. I fancy a great many

Surveyors do use decimal tapes altogether as I notice in descriptions that acres and 100ths of acres are used, and many Surveyors in this part of the country now give their descriptions in feet and 10ths. But the difficulty I met with there was I found the practical man, the carpenter, said, I cannot get wood cut to feet and 10ths, I have to get it cut to inches and 8ths, because the machinery for cutting wood is graduated in that way. I find too that the iron men say, Plates are all rolled that way, and bolts are made that way, and the threads to the inch in screws are all cut as so many 16ths or 32nds., etc. If there is a possibility of changes in these modes of measurement happening in a short while, the metric system may possibly be adopted.

Mr. Sewell:—The fact is that feet and inches are more convenient for sub-division than a decimal system; when you come to machinery twelve is much more convenient for sub-division than ten; when you get your feet into decimals it is a very awkward thing and there is no absolute correctness.

Mr. McDowall:—There would be no room on a tape to put a metric system.

Mr. Sankey:—Yes, if it became necessary, there is the back of the far end of the tape. We could use the last link on the back of the tape, and substitute a meter there. These manufacturers have all the plates to do that. You can get a plate graduated on one side in feet and inches and on the other side into meters and 10ths. There would be no difficulty about that at all. But those already in possession of these tapes would find it difficult to have the alteration made.

Mr. McDowall:—That is what I mean.

Mr. Sankey:—The tapes would have to be sent back to the manufacturers.

President Ross:—Why not buy a new tape.

Mr. McDowall:—Yes, I suppose the tapes would be pretty well worn.

Mr. Sankey:—I wish Mr. Butler were here because he has taken quite an interest in this matter and could have told us of some practical experience he has had lately. He was getting out a specification for a building on some German principle that was all worked out in meters and decimeters; and I forget now how many reams of foolscap it took to get out the measurements he required, for the workmen who were going to build. He says

it was an awful job; that he had to take out the measurements to two or three places of decimals every time; and he showed us one or two little calculations that filled most of a page of foolscap. If one had a large specification to get out in that way it is easy to see how great the difficulty of changing from one system to the other would be.

Mr. Sewell:—It would be an endless job. The change is not likely to come in our life-time nor in the life-time of our grandchildren.

Mr. H. J. Bowman:—Do you propose to charge $4 for one of these tapes ?

Mr. Sankey:—Yes.

Mr. Dickson:—Are we likely to get them in free of Duty ?

Mr. Sankey:—We may possibly get them in free under the head of scientific instruments.

Mr. Dickson:—They would be government supplies.

Mr. H. J. Bowman:—If the metric system should be adopted in say ten or fifteen years from the present time I suppose we could stand the price of another standard and probably it would be better to have one then any way. In the meantime it seems to me it would complicate matters to have links, and feet, and meters all on the same standard. If the metric system is adopted, which no doubt it will be in time, because like everything else the system of measurement should be uniform throughout the world; and if Germany and France and the other Continental countries have come to that standard there is no reason why England and the United States should not do so as well. I think some of the difficulties at least will gradually fade away. But it seems to me for the present time we had better just have feet and links, and when the metric system is adopted, if it ever is, the old systems will have to be dropped. It is a question whether in measuring land we should not drop one or the other now. There is no doubt that the method of expressing areas in chains and links is very convenient. Young Surveyors are apt to think chains and links are out of date; but as we go on in practice we gradually drop the feet and inches, as more difficult to apply than chains and links. Feet and inches are not in the decimal system, whereas chains and links are; and the mere fact of chains and links being so much more convenient shows us how much easier the metric system will be for all measurements after a while when all is on the decimal system.

Mr. Sewell:—There is one great objection to the metric system; it is based on latitude in Paris; our yard is based on Greenwich, practically being the swing of a seconds pendulum at a temperature of 62 Fahrenheit at Greenwich, so that we have always in British Territory the standard of the yard. If we had the metric system and we chanced to be at war with France we couldn't get a standard.

Mr. H. J. Bowman:—Mr. Sewell is very patriotic. I will not be behind him in patriotism but I want to remind him that the question is not whether we should adopt a standard that is derived in Paris or in Greenwich, but the decimal system. We have this system in our currency, and we do not consider ourselves unpatriotic. We no longer have to wade through pounds, shillings and pence, but we have the United States method of dollars and cents and it is a very good method too. All we want, after a while, is to have the decimal system carried out for our measurements, both superficial and cubic, so as to apply it to everything. I think, speaking on the matter of patriotism, as we have adopted the decimal system in currency we might use it in everything else without in any way being thought disloyal to the great Empire of which we form a part.

Mr. Sewell:—We have the decimal system in use. There is our Surveyors' chain, which is a four rod chain, and is based on the English yard. I object to our adopting a French standard as in the metric system, not because it is decimal, but simply because the data by which it is arrived at is outside of British Territory.

Paper: "Surveys for Municipalities" by Mr. H. J. Bowman.

Mr. Bowman:—The title of this paper, according to the programme is "Surveys and Plans for Municipalities;" but I found out as I went along that probably one-half of the paper was sufficient at the present time, so I have omitted "Plans" and the title will now stand, "Surveys for Municipalities."

"Moved by Mr. Aylesworth, seconded by Mr. Dickson, that the paper be referred to the Legislation Committee and printed in the minutes and that the thanks of the Association be tendered to Mr. Bowman," the President put the motion, and, on a vote having been taken, declared it carried.

The President tendered the thanks of the Association to Mr. Bowman.

Mr. Bowman:—Thank you, Mr. President.

The President called on Mr. Aylesworth to present the report of the Committee on Surveying.

Mr. Aylesworth:—Your Committee on Surveying has nothing special to report this year. The Chairman of the Committee wrote to most of the members of the Committee to present papers, but he has not received any papers. The Committee has had under consideration and begs to submit the following conclusions;

Read answers to questions 1, 2 and 3, which were illustrated by Mr. H. H. Gibson on the blackboard. On motion answers to questions 1, 2 and 3 were approved of by the meeting.

12.35 p.m., adjourned to 2 o'clock p.m.

Afternoon Session.

Wednesday, 27th February, 1901, 2 o'clock p.m.

The President called the meeting to order.

Mr. Aylesworth concluded the reading of the report of the Surveying Committee, and on motion the several answers to the questions therein contained were adopted.

Moved by Mr. Gibson, seconded by Mr. Dickson, that the report of the Committee be adopted as amended. Carried.

Captain Bernier here delivered his lecture.

President Ross:—Captain Bernier has not only exhibited his views but he has shown us that he knows what he is talking about, and seems to appreciate our sympathy. We desire to show him that we are deeply interested in this work and that we would be glad if the Government granted him the funds necessary to equip his expedition.

I would like to hear from any one present or to receive any motion any one has to make with regard to this matter.

Mr. Tyrrell:—We have all been delighted with the address which Captain Bernier has favored us with this afternoon, and the beautiful views to which we have been treated. I do not propose at all to give anything in the way of remarks myself but merely to express my deep appreciation of the address which I consider admirable. We as Canadians should be proud of Captain Bernier and should certainly give him our support in every tangible way.

As he intimated, I did, a couple of years ago, express my belief in his enterprise; and I can only reiterate that fully this afternoon. Captain Bernier is undoubtedly on the right track. It is proven beyond question that the drift is as he has indicated and it seems to me that the whole problem of reaching the Pole is after all a simple one now that we have the light thrown upon the subject by such a man as Nansen whom most of us have had the pleasure of hearing.

I am sure we all wish Captain Bernier every success, and it would afford some of us much pleasure, to see an Ontario Land Surveyor a member of his party. I should be only too glad, if I were at liberty to do so, to volunteer my own services.

I have much pleasure in moving a hearty vote of thanks to Captain Bernier for his kind address.

Mr. Dickson:—I am sure we are all under an obligation to Captain Bernier for having taken the trouble to come here and address us to-day. It is something I have read a great deal about, but I am no sailor myself, and personally I know nothing about the drift. But I have always taken a great interest in Polar expeditions and I believe if I were forty years younger I would almost give my right hand for the privilege of going with him.

He has been preceded by a great many eminent men, Englishmen, Americans and others. I was once talking to an old English Sea Captain, when he, looking at a map of the world, traced with his finger along to the Pole, and said, It can be done and England ought to do it. I still think that, as he said, it can be done. Although millions have been spent and hundreds of lives have been lost and although we cannot say whether very great results may be derived from the discovery of the Pole, the Captain's efforts ought to be seconded and Canada ought to help to pay the cost. If Captain Bernier is giving his own time, it is all that should be expected of him; and I do not believe there is a politician in the whole of Canada who would utter one word of complaint if the Government footed the whole bill. England has footed a great many bills to try to attain the same object, and I hope that Canada will assume the responsibility, at any rate she will do what she can to forward the scheme. When Captain Bernier returns, as I hope he will, whether successful or not, we will look upon him as one of the greatest explorers Canada has produced.

I have very much pleasure in seconding the motion calling for a vote of thanks. (Applause).

President Ross put the motion, and on a vote having been taken, declared it carried unanimously; and tendered the thanks of the Association to Captain Bernier for his very interesting and instructive lecture, and assured him that he had the hearty sympathy of the members of the Association.

Captain Bernier:—I feel highly honored at being permitted to give you my views upon the subject of the North Pole. I have made this question a study for twenty-three years, and if it is God's will I hope to reach the Pole. I will do my part to get there, and I have it in my inner soul that I can accomplish it.

I have heard some people remark, " Captain Bernier has been a master for thirty-one years, and he must be an old man now." Let me tell you, I am not an old man; I am not as old as I may look. I have been accustomed since my childhood days to outdoor exercise. As I look about me here to-day, I see a great many white heads, a great many men of over sixty years of age, but I see that these men are still full of vigor, and the reason for that is that they have always led active outdoor lives, as I have; and when a man has led an active life he does not rust and when he does not rust he will wear for a long time. I am the smallest member of my own family—all my relations are about six feet tall—and it might be said that as I am the smallest my heart must be small; but my blood runs quick because it has not got so far to go. (Laughter).

If any of you gentlemen have friends in Ottawa I would like you to tell them what you think of what you have heard me speak of to-day. But if you think I am going in the wrong direction, now is the time to say so; do not let me go, and after I come back, say, Well you did not go the right way. What I learn from you is for the benefit of Canada. Canada is a big place there is no doubt but there is room yet for thousands and those thousands are steadily coming all the time from mother England, Ireland, and from France and they are populating what I call, Big Canada. Now, we want to take this Pole before anybody else does; and I think it is time now for us to conquer that little bit of northern land and water which may hereafter be some good and may bring in some results for Canada.

I thank you most heartily for your kind reception and your sympathy.

President Ross:—I would like to hear the opinions of the members in regard to the Government assisting Captain Bernier; and I would like to have a motion in regard to that.

Mr. Chipman:—I would move, if I can get a seconder, that a Committee be appointed comprised of Mr. Tyrrell, who has explored the North of Hudson Bay, Mr. Stewart, who has been in the Yukon, and the mover, to draft a proper resolution approving of the scheme of Captain Bernier; such motion also to include a recommendation that the Government bear the expense of the expedition. As one who has studied this problem beside the grate fire in my library, on paper, I certainly feel that Captain Bernier is on the right track. Many years ago I stated before this Association that the proper route was exactly the one which is now mapped out by Captain Bernier.

Mr. Proudfoot:—I have much pleasure in seconding the motion.

The President put the motion, which was carried unanimously on a standing vote.

President Ross:—I have very much pleasure in announcing to you, Captain Bernier, that this motion is carried.

Captain Bernier:—I feel greatly honored; and when I go before Sir Wilfrid Laurier, I will be very glad to say the Surveyors of Ontario are in sympathy with me.

On motion, the meeting adjourned until Thursday, 28th February, at 10 o'clock a.m.

Morning Session.

Thursday, 28th February, 1901, 10 o'clock a.m.

The President called the meeting to order.

The President invited Captain Bernier to a seat on the platform.

Paper:—"Regulation of the Level of Lake Erie," by Mr. F. W. Farncomb, read by Mr. Tyrrell.

The President put the motion as follows: Moved by Mr. A. R. Davis, seconded by Mr. H. H. Gibson, that the thanks of the Association be presented to Mr. F. W. Farncomb for his paper and that the paper be published in the proceedings and on a vote having been taken, declared it carried.

President Ross here retired and Vice-President Dickson took the chair.

Paper:—"Topographic Photography," by Mr. J. N. Wallace; read by Mr. H. H. Gibson

Vice-President Dickson:—I am sorry there was not a larger attendance this morning while this paper was being read. It is a somewhat long and a very important one; photographic surveys are now taking a prominent place in our profession. I do not know much about photography myself, and I do not suppose I will ever learn. There is a great deal to be learned about it. One thing we do know is that a photograph is always correct. There is information in this report that is of great importance, not only to our profession, but to the legal profession, and to the public in general. The writer must have devoted a great deal of time and thought to it; I know from experience, that a man cannot sit down and write such a paper at a moment's notice. This paper should be published in full in our Minutes. I will be glad to hear any discussion on the matter.

Mr. Ford:—I would like to move a vote of thanks to Mr. Wallace for his paper and for the interest and trouble he has taken. Mr. Wallace is a personal friend of mine; and he has told me about the very arduous work he had out there. I am sure he took a great deal of time to write that paper. It is a matter that is of great interest to us.

Mr. C. A. Jones:—I have very much pleasure in seconding the motion.

Vice-President Dickson put the motion as follows:—Moved by Mr. Ford, seconded by Mr. C. A. Jones, that a cordial vote of thanks be tendered to Mr. Wallace for the very valuable paper which he has presented to this Association; and that the paper be printed in the Proceedings; and, on a vote having been taken, declared it carried.

Moved by Mr. Van Nostrand, seconded by Mr. H. H. Gibson, that the Report of the Topographical Survey Committee be taken as read, and printed in the Proceedings. Carried.

Moved by Mr. H. H. Gibson, seconded by Mr. Van Nostrand that the report of the Committee on Entertainment be taken as read and printed in the Proceedings. Carried.

On motion the meeting adjourned to meet at 2 o'clock p.m.

Afternoon Session.

Thursday, 28 February, 1901, 2 o'clock p.m.

President Ross called the meeting to order.

Mr. Dickson:—Before going on with the routine business of the meeting I have a resolution I would like to introduce. Yesterday, after listening to the very interesting lecture by Captain Bernier, it was the unanimous opinion of this Association that his scheme to reach the North Pole was a feasible one; that he had made thorough investigation and seemed to fully understand what he was doing, and was ready to offer himself up as a sacrifice on behalf of science. And this Association was of the opinion that as he was giving his time and his person we, as Canadians, should bear the expense; and a Committee was appointed to draft a resolution to that effect to be forwarded to Ottawa. That Committee has placed the resolution in my hands with letter attached and has asked me to move its adoption.

THE RIGHT HONORABLE SIR WILFRID LAURIER, G.C.M.G., P.C., OTTAWA.

Sir,—I have the honor to transmit to you herewith on instructions from the Association of the Ontario Land Surveyors the enclosed resolution, which was passed at the Annual Meeting of the Association held in Toronto on the 26th, 27th and 28th days of February, 1901.

This resolution was discussed and carried, after having heard Captain J. E. Bernier's description of his proposed undertaking and the methods he intends to employ in order to accomplish his purpose of reaching the North Pole.

The meeting was a very representative one of the Land Surveyors of Ontario, some of whom have already been beyond the limit of the Arctic Circle, and are therefore, in a position to form an opinion as to the necessities and difficulties of, and the advantages to be derived from, such an undertaking.

I have the honor to be, Sir,

Your obedient servant,

Villiers Sankey.

Secretary of the Association of Ontario Land Surveyors.

Moved by Mr. James Dickson, Vice-President of the Association; seconded by Mr. Willis Chipman, and resolved that:

"Whereas the Association of Ontario Land Surveyors has for many years made a study of Polar Explorations;

And the Committee of the Association on Polar Research engaged Lt. Peary to lecture before the Association in 1896, and in 1897 the Association instructed this Committee to attend Dr. Nansen's lecture, after his return from his "Farthest North";

And the expeditions of De Long, Nansen, Abruzzi, and others, have established beyond doubt the theory of the constant and regular drift of polar ice from Behring Strait across the Pole towards Iceland;

And several members of the Association have been engaged from time to time in exploring British America in the vicinity of the Arctic Circle;

And the Association holds that all portions of British North America should be fully explored and mapped, and all of our northern heritage claimed;

And the Association has heard Captain J. E. Bernier's lecture upon his projected voyage, and has heard his proposed equipment described;

And they believe Captain Bernier to be a suitable and capable person to command a Polar Expedition:

Therefore this Association at its Annual Meeting, hereby fully endorses Captain Bernier's proposed route to reach the vicinity of the North Pole *via* Behring Strait, thence north-westerly along the coast of Siberia until in longitude 170° east, thence northerly as far as practicable into the pack ice, thence drifting across the Arctic Sea in the direction of Iceland to navigable water; and believe Captain Bernier with proper support will succeed in his undertaking;

And the Association would respectfully urge upon the Dominion Government, the desirability of bearing all expenses in connection with fitting out the expedition and equipping the same;

And that a copy of this resolution be forwarded to the Premier of Canada."

This resolution was carried at the Annual Meeting of the Association of Ontario Land Surveyors, held in Toronto on February 26th, 27th and 28th, 1901.

VILLIERS SANKEY,
Secretary of the Association of Ontario Land Surveyors.

President Ross:—This resolution prepared by the Committee appointed at our meeting yesterday afternoon states the fact very clearly and properly and is very well drawn out. I take much pleasure in laying the resolution before you.

Mr. Tyrrell:—As a member of that Committee I might just state that we wished to embody in that resolution the fact that for years we have been not merely interested in a superficial way but we have taken a deep interest in this subject of Polar Ex-

ploration; and we have endeavored to put the resolution in a forcible way.

The President put the motion, and, on a vote having been taken, declared it carried.

President Ross:—Captain Bernier: I have very great pleasure in presenting you with a copy of this resolution which will be properly signed and sealed and a certified copy handed to you.

Captain Bernier:—Thank you, sir.

Mr. President, Vice-President and Gentlemen, I am very pleased to see that you have already made some start towards the North. This act of yours will be recorded in history. I have my life written down from the time I was twelve years old and to-day I am proud to say I will be able to register in my book that the Land Surveyors of Ontario have approved and further have declared that the proposed voyage to the Pole is by the proper route. With the help of God, we will reach there.

And this is for the benefit of Canada. When I was in England they said, Canada is a great place, a great country; if you can afford to send us 2,000 of your boys to help us in our difficulty surely you can send twelve or fourteen men to the North to explore and take what is your own land. I said, Gentlemen, I am one of them, and I am on the road. They said, if Canada will do something for you we will also be very pleased to give you some encouragement. Now, I am waiting for the Canadian Government to sanction it and for an appropriation, and then in England we will get some instruments or other things that we require for that voyage. Lord Strathcona was at my lecture, and he said he believed the climate would not keep any Canadian from going there; he said, The climate is such that when you get on the sea level of the polar basin it is nothing to compare with what we have in Winnipeg and Alaska.

I beg to thank you very heartily for your kindness to me, and I hope some day to come and tell you all about our voyage and our successes. As I said last night, I would feel very proud if one of the Surveyors of Ontario—one of the boys—would come along; and I am sure the application would be favorably considered and I would be proud to have one of the boys with me. (Continued applause).

President Ross:—I have here the report of the Committee appointed to draw up a suitable address of condolence to His Majesty the King.

To The King's Most Excellent Majesty

Most Gracious Sovereign,

The Association of Ontario Land Surveyors at its Annual Meeting held at the Parliament Buildings, Toronto, Canada, on February 28th, 1901, desires to place on record its deep sense of the loss sustained by the Empire in the death of

Her Most Gracious Majesty Queen Victoria

During her long reign her beneficent sway assisted to mould the various portions of the Empire into one harmonious whole, and all portions of the Empire mourn her loss.

Each member of the Association of Ontario Land Surveyors having, by virtue of his office, taken the oath of allegiance to the Sovereign, has felt and mourned her loss.

In renewing its allegiance to His Most Gracious Majesty King Edward the Seventh, the Association of Ontario Land Surveyors prays that his reign may be a long and happy one guided like that of his Illustrious Mother by Divine Providence.

Killaly Saukey
Secretary

Geo. Ross
President

Moved by Mr. Dickson, seconded by Mr. Kirkpatrick, that the report of the Committee as read be received and adopted, and that a copy of the resolution be transmitted through the proper channel.

The President put the motion, and on a vote having been taken, declared it carried.

President Ross:—We will have a statement now from Mr. Stewart regarding the Report of the Exploration Committee.

Mr. Stewart:—I regret very much that my report is not quite in shape for reading. I did not know until last Saturday that I was chairman of this Committee; no doubt that was through my own fault; and since then I have not had time to get my report quite in shape, but I shall have it ready in a day or so, and place it in the Secretary's hands.

The Programme mentions a "Digest of Northern Ontario Explorations." The result of the explorations last summer has not yet been made public, so of course the report cannot give any results. In that respect, about all that can be given is a statement of what was intended to be done.

Moved by Mr. Proudfoot, seconded by Mr. Gibson, that the report be taken as read, and printed in the Minutes. Carried.

Mr. Kirkpatrick:—I would suggest that the Chairman insert a digest of it in time for printing; getting it as soon as it is published. He can prepare a digest of it, and it can come out in our Annual Report

President Ross:—Could you state when you would probably have this report ready, Mr. Stewart ?

Mr. Stewart:—It will depend now on when it is published. I suppose that in a week after it is published by the Department I could probably have my report ready.

President Ross:—We have on our programme a couple of items under the head of Discussion. One is on the "Duties of Surveyors as Referees," and the other is "Track Surveying." We would be glad to take up those discussions now. If we have present with us any member who will be kind enough to open up these subjects we will be glad to hear them.

We will first take up the discussion on The Duties of Surveyors as Referees. I understand that three of our members have had experience along this line; I refer to Mr. Kirkpatrick, Mr. Van Nostrand and Mr. McDowall. We will be glad to hear from Mr. McDowall.

Mr. Chipman:—I would like to know if any member can enlighten us as to the variation of the magnetic needle on the Siberian side of the North Polar Region. What is the magnetic variation ? Is it of such constancy and is there such force there as to produce a safe guide for navigators ? I am interested in this on account of Captain Bernier.

Captain Bernier:—On De Long's voyage he experienced from 18 to 23 degrees east, then, as he went north and west, it was decreasing. Then when we go back to Dr. Nansen, I find it was westerly increasing. From the time he left his ship to 86° .14′ there was a westerly deviation of 44° 4′, increasing going north, therefore I conclude that at the Pole there would be no less than about 55° westerly, because when running the curves over known points, when I come to join the points I find they would unite in Greenland. Between Greenland and Spitsbergen there is 35° and as we go to the westward it would increase again. So I expect when at the Pole the needle will be about 55° west.

Mr. Chipman:—I asked the question because one of our leading members to-day in discussing this question said that possibly another magnetic pole might be discovered on the Siberian Coast, and in the region between the two there would be no variation or there would be such variation as to prevent any navigation.

Captain Bernier:—I think there are only two magnetic poles, which are the negative and the positive.

President Ross:—There are some local poles.

Captain Bernier:—A local pole is a place where there is no disturbance. There is one in the South Sea after you pass the Cape of Good Hope, and there you will find there is no magnetic error; and on the coast of Siberia it is an easterly variation all along the Coast. If you read the voyage of De Long you will find the variation was decreasing as they went west.

I consider there would be a very large area where the needle will be about 180 degrees, in the neighborhood of 70 degrees north latitude.

Mr. Chipman:—I think the Committee on Repository and Biography should be stirred up. We find this year there is no biographical sketch, a very serious omission. I think each year a great effort should be made. The Committee is now two years old and surely in that time we should be able to secure the

portrait and biographical sketch of some of the earlier Surveyors General.

Mr. Van Nostrand:—This matter has received a very great deal of attention from the members of the Executive, and so far as the members that are in charge and responsible for that work are concerned everything has been done to secure biographical sketches and photographs of each of the few Surveyors General whose biographical sketch and picture has not appeared; but it has been impossible to find even representatives of those who are remaining. My recollection is that Mr. Wyatt, Mr. Cameron and one or two others whose names I have in a list here, have, so far as we are concerned, passed out of history. Further than that even if we could find representatives of Surveyors General their number is so small that they would only last us for a few years, and then what shall we do? What shall follow this practice of publishing a biographical sketch of a Surveyor-General each year? This question should receive attention now.

Mr. Chipman:—I think there are a great many able Surveyors who have passed away whose portraits we now have in our collection and as soon as we exhaust the Surveyors General we could commence publishing the portraits and biographical sketches of the early Surveyors.

Mr. Walker:—I think it would add very much to the interest of the proceedings to have a biographical sketch in the proceedings each year. If we run short of dead subjects why not give a few living ones? The Canadian Society of Civil Engineers publishes each year a portrait of its president. I think this is a very good thing indeed, then, as has been stated here, it is very difficult sometimes to get a good likeness of men after they have passed away, but we can always get good ones of those who are still with us. For my part, I do not see why we should wait until men are dead before we put their pictures in our proceedings.

Mr. Chipman:—Has any member of the Association volunteered to accompany Captain Bernier?

The President:—I think he stated to me that several members of the Association had volunteered; but I do not know positively. There is no doubt before the Captain completes his staff of assistants and sailors he will have several applications from our members.

Mr. Chipman:—I am sorry there are not more of our members here to-day. We should treat this matter more seriously, and should give Captain Bernier more assistance. It is a laudable enterprise and well-worthy of our support. We must not look at it from a monetary point of view, altogether, though if I were a younger and a more robust man, I would not hesitate at all to go, for I believe there is money in it. As I stated to the committee this morning I understand that Lieut. Peary cleared $40,000 one season after he returned. Many of us work a long time surveying before we do that. And Dr. Nansen has received over $100,000 on royalties on his books alone for one year.

The President:—I have, no doubt, some of our members, who appreciate this work, and the value of it, and the money that is in it, will volunteer to accompany the Captain.

Mr. Dickson:—I do not know that we can do any more in the matter than to recommend that some members of the Association should volunteer. One thing I do feel satisfied about, that either on the expedition, on the platform, or anywhere else, the Ontario Land Surveyor can hold his own; his writings are instructive and interesting, and his calculations are as accurate as they are interesting; this Association should ask some member to volunteer to accompany Captain Bernier.

Mr. H. H. Gibson:—When does he intend to start for the Pole ?

The President:—A year from next May, Captain Bernier desires to get one of our members who has had considerable experience in exploring on land in the Arctic regions. He is most anxious to have some member of this Association to accompany him. Before Dr. Nansen and Mr. Peary started, Mr. Chipman wrote to them and asked if they had an opening for one of our members.

Mr. Chipman:—Both were written to. Lieutenant Peary gave a definite answer. The volunteer, if I remember right, was requested to subscribe some hundreds of dollars towards the expedition.

Mr. Tyrrell:—No; Lieutenant Peary wrote asking the Association to have a member sent as a representative.

Mr. Chipman:—But when I wrote further, he said he was expected to contribute about $500 for the privilege of going—some hundreds of dollars.

Mr. Tyrrell:—There is no salary ?

Mr. Chipman:—No.

The President:—From what Captain Bernier told me, he expected a member of this Association going would have a salary equal to what he would have if he were working under the Department of the Interior.

Mr. Chipman:—If a member of the Association should volunteer, the Provincial Government might pay his salary while away ? I do not think there would be any doubt about that.

The President:—Have you a resolution ?

Mr. Chipman:—There is no need of a resolution. This matter should be brought before the members of the Association individually at an early day, before the proceedings are out; I think the Executive should take means to do so.

Mr. Tyrrell:—It would be well to have a small circular printed and sent to each member of the Association.

Mr. Chipman:—I will move that a circular respecting Captain Bernier's Polar Expedition be sent to all members at as early a date as possible, calling for volunteers to accompany the expedition, and at the same time outlining Captain Bernier's plan. This circular to include a copy of this resolution.

The President:—The Captain told me, he desired that any member volunteering should be approved by this Association as a body; or if no member of this Association would volunteer that we should select some one else, to represent us.

Mr. Tyrrell:—I have very much pleasure in seconding Mr. Chipman's motion.

The President put the motion and on a vote having been taken declared it carried.

Mr. Dickson: moved, seconded by Mr. Gibson, that the President, Mr. Ross, leave the chair and that Mr. Chipman take the same.

The Vice-President put the motion, and, on a vote having been taken, declared it carried.

The President left the chair, and Mr. Chipman took it.

Mr. Dickson:—I have much pleasure in moving that a cordial vote of thanks of this Association be given to Mr. Ross, our retiring President for the very gentlemanly and able manner in which he has presided over our deliberations.

Mr. C. A. Jones:—I have much pleasure in seconding that motion.

Mr. Chipman put the motion and on a vote having been taken, declared it carried.

Mr. Chipman tendered the vote of thanks to Mr. Ross, the retiring President.

Mr. Ross:—Gentlemen, I thank you most heartily. It has been a very great gratification to me to be President of this Association; and I consider it a very high honor conferred upon me. I was appointed Vice-President in the room of Mr. Foster, one of the greatest ornaments to the profession of Ontario Land Surveyors.

I think every member of this Association should aspire to hold this very high position. I am sure it would benefit any one to have that ambition. While I did hope to be President some day I was elected sooner than I expected to be.

I thank you gentlemen for the honor you have done me, the kindness and courtesy you have shown me and the good feeling that animated you in passing this resolution and tendering me the thanks of the Association. (Applause).

On motion of Mr. Dickson, seconded by Mr. Walker, the meeting adjourned, after singing the National Anthem.

PRESIDENT'S ADDRESS.

Gentlemen,—It gives me very much pleasure to have the honor of presiding at this, our first Annual Meeting in the new century, and welcome you to the sixteenth meeting of the Association, being the ninth, since the Act of Incorporation was passed. I am glad to note that the programme contains a good list of topics of interest to the majority of our members and, although there may not be so many papers to read, as on some previous occasions, there will be all the more time for discussion, and I have no doubt that this meeting will be a successful and profitable one.

It is gratifying to notice so good an attendance at the first session this year, as it augurs well for a full and regular attendance at all the sessions. There are at present 220 active members on the register, but only about one-fifth of our number usually attend the Annual Meetings, and an examination of the record shows that a very large percentage, if not the great majority, of the members never attend a meeting; never con-

tribute a paper, nor assist in the work of Committees. Since incorporation, the number of members attending the Annual Meeting has varied between 53 and 40; but the list of the names of members attending one year is very similar to a list of those attending any other year. A member attending one meeting usually looks forward with pleasure to the next, knowing that he is benefited by coming into contact and exchanging opinions with other members, and becomes a regular attendant and contributor. I do not suppose that any member prides himself on keeping aloof from our yearly gatherings, or in taking no part in the proceedings, or sighs for the old days in which there were no fees and no reports, therefore I venture to ask an additional number of members to become "active," in other respects than the mere payments of their fees. Members of our Association receive many benefits besides those conferred upon them by having legislation affecting their interests looked after, and unqualified intruders dealt with.

On the 22nd of January last, our beloved Queen died at Cowes, in the Isle of Wight, thus closing the longest and most illustrious reign of the world's greatest Empire. There are very few of our members who ever had, or can remember having any other sovereign; we have all taken the oath of allegiance to her, and can look back with pride and pleasure to having lived in the Victorian Era, in the reign of a queen who commanded the reverence and love of not only her own people, but the people of all lands. Her virtues and devotion have been a perpetual lesson and will remain an undying heritage. In the neighboring Republic, a land that once formed a part of the British realm, and that later fought against it in deadly strife, this granddaughter of George III. was mourned by rich and poor alike, and memorial services were held that were marked throughout by heartfelt sorrow. Thus she whose reign was crowded with victories, she who encouraged science, art, and literature, passes into history, followed by the affection of all the peoples of the earth." I recommend that a Committee be appointed to draw up and transmit through the proper channels, a suitable memorial showing the esteem and affection in which the Queen has always been held by the members of our Association, and the great loss her death has been to the Empire.

King Edward VII has commenced his reign, better qualified than any of his predecessors to fulfil the arduous duties devolving upon him, and will, without doubt, prove a worthy successor to his illustrious mother. As the Prince of Wales, he not only be-

came the most popular man in England, but won the esteem and affection of all, by his direct personal patronage of every charitable, beneficial, or scientific movement, and on taking the oath of accession, he said it would be his aim to work for the good and amelioration of his people.

I am sorry to have to announce that the hand of the reaper, death, has been at work among us during the past as on previous years, and has removed T. O. Bolger, (Kingston); D. B. Brown, (Cornwall); J. McCallum, (Fort Francis); J. M. Tiernan, (Tilbury Centre), and W. S. Davidson, (Sarnia). An extended reference to these members will be found in the obituary column.

It is with pleasure I note that the efforts of the Good Roads Association formed in 1894, is being crowned with success, and that many of the County Councils throughout the Province are taking steps to macadamize or permanently improve a network of main leading highways. This work is being fostered by the Government of Ontario, which will probably contribute one-third of the cost. If the condition of the roads is the measure of the character of a people, it is high time that the rural highways in this Province be put in a condition to reflect credit and not disgrace on an intelligent and progressive country. Many of our members will benefit by this improvement in at least being able to get back and forth from their operations in the field with greater ease and comfort, if not financially, in laying out and supervising the construction of the work.

During the past season several of our members have been engaged in exploring the northern part of this Province, and their reports will probably show vast tracts of mineral, timbered and agricultural lands. Extensive subdivision surveys may be looked for at an early date in this region, and when New Ontario is opened up by the projected railways, the hum of the pulp-mill, nickel and steel plants will be heard in the land.

The war in South Africa is now happily being brought to a successful close; a result to which Canada's sons contributed in no small measure. This war has shown to the world how firmly the bond of sympathy has been knit between the Mother Country and her colonies, and has also served to bring Canada and its resources prominently into the notice of Great Britain, which will no doubt be a means of stimulating the trade and commerce of this country.

I am happy to note that Canada is about to become prominent in Polar exploration, and that Captain Bernier, whom we have

present to-day, and who will address us on this subject to-morrow, has interested the Government of the Dominion in his proposed expedition to the North Pole, and is likely to set out with a suitable vessel, and the most modern equipment, at an early date. His work and progress will be watched with our hearty and active sympathy, and though he may not succeed where all others have failed, he will at least reflect honor and credit, not only on himself, but also on his country, and we hope he may have the supreme satisfaction of declaring the whole of the Pole as belonging to Canada by right of discovery.

GEO. ROSS,
President.

February 26th, 1901.

NOMINATION AND ELECTION OF OFFICERS.

The President called for nominations for the office of President for the ensuing year.

Mr. Kirkpatrick moved, seconded by Mr. Proudfoot, that Mr. James Dickson be president for the ensuing year.

There being no other nominations President Ross declared Mr. James Dickson duly elected President of the Association for the ensuing year.

President Ross called for nominations for the office of Vice-President.

Mr. Van Nostrand nominated Mr. W. R. Aylesworth of Belleville; seconded by Mr. C. A. Jones.

There being no other nominations the President declared Mr. W. R. Aylesworth of Belleville duly elected Vice-President for the current year.

President called for nominations for the office of Secretary-Treasurer.

Mr. Dickson nominated Mr. Villiers Sankey, of Toronto, for the office of Secretary-Treasurer; seconded by Mr. H. H. Gibson.

There being no other nominations the President declared Mr. Villiers Sankey duly elected Secretary-Treasurer for the current year.

The President called for nominations for the office of Auditor.

Mr. Walker nominated Mr. A. J. Van Nostrand, of Toronto, and Captain Gamble of Toronto, as the auditors; seconded by Mr. McDowall.

There being no other nominations, the President declared Messrs A. J. Van Nostrand and Captain Gamble duly elected as auditors for the current year.

The President called for nominations for members of Council.

The following nominations were handed in:

Mr. A. Lougheed, of Port Arthur, nominated by Mr. Proudfoot.

Mr. C. A. Jones, of Petrolea, nominated by Mr. Dickson.

Mr. John McAree, of Rat Portage, nominated by Mr. Van Nostrand.

Mr. C. J. Murphy, of Toronto, nominated by Mr. Kirkpatrick.

Mr. J. W. Tyrrell, of Hamilton, nominated by Mr. Walker.

The President appointed as scrutineers Messrs Esten and J. F. Whitson.

President Ross then introduced Mr. James Dickson, President elect, to the meeting.

Mr. Dickson:—Gentlemen: I thank you very kindly for the very high honor you have done me in electing me your President. I have been a member of the Council for one year, and Vice President during the past year, and during my connection with the Association as a member of the Committee and as an officer I have always been able to say that every member of the Association has given his most hearty co-operation and assistance to the office-bearers, and I feel sure that I can count on your assistance in the future as the other officers have in the past, and I know that you will do all in your power to aid me in the proper discharge of the duties of my office as President of the Ontario Land Surveyors' Association for the year 1901-2.

It was moved by Mr. Dickson, seconded by Mr. Walker, that the Secretary-treasurer be paid the sum of $225 as a slight mark of appreciation on the part of the Association for his services as Secretary-treasurer last year. Carried.

Moved by Mr. Kirkpatrick, seconded by Mr. Dickson, that the Association has heard with deep regret of the loss by death of the following members of the profession since the last Annual Meeting of the Association: Walter Stanley Davidson, Joseph Martin Tiernan, Thomas O. Bolger and David Rose Brown and that a copy of this resolution be forwarded to each of the respective families of the deceased members. Carried.

Moved by Mr. H. H. Gibson, seconded by Mr. C. A. Jones, that any omissions or clerical errors in the records of this meeting now in the hands of the acting secretary and stenographer be corrected by the committee on publication before being printed. Carried.

Moved by Mr. Tyrrell, seconded by Mr. Walker, that a Committee on Polar Research be appointed by the Council. Carried.

Moved by Mr. Walker, seconded by Mr. Robertson, that a fee of $5 be paid each of the auditors on completing their work of auditing the accounts of the past year. Carried.

Moved by Mr. Van Nostrand, seconded by Mr. H. H. Gibson, that the Council of Management be instructed to take up the question of the preparation of papers for the programme for the next Annual Meeting, and that this shall be a matter in which the Council has full responsibility, and that the members thereof be instructed and requested to see that the papers are forthcoming as required. Carried. Mr. Walker asked for information in regard to a paper by Mr. Wicksteed on Railway Work, which was ordered to be published in the proceedings of last year, but which does not appear.

Mr. Van Nostrand stated that the publication of the paper was authorized by the meeting; that the paper was taken as read, and directed to be printed in the proceedings, but the paper was not forwarded, and therefore could not be printed.

NOTE.

The following letters have been received from Ottawa in response to the Address of Condolence sent to His Majesty the King, which is given in fac-simile on page 29.

B

SECRETARY OF STATE, CANADA.

File No. 186.

Ottawa, 11th May, 1901.

Sir,

I have the honour to acknowledge the receipt of your letter of the 10th instant, advising of the transmission of a copy of a resolution passed by the Association of Ontario Land Surveyors, expressing condolence on the occasion of the death of Her late Majesty Queen Victoria, and praying that the reign of His Majesty King Edward the Seventh may be a long and happy one, and to state that the same has been forwarded through the proper channel to the end that it may be laid at the foot of the Throne.

I have the honour to be,

Sir,

Your obedient servant,

Joseph Pope,

Under-Secretary of State.

Villiers Sankey, Esq.,
Secretary-Treasurer,
The Association of Ontario Land Surveyors,
City Hall, Toronto, Ontario.

SECRETARY OF STATE, CANADA.

W.

No. 186. *Ottawa,* 11th July, 1901.

Sir,

Following up a letter from this Department, dated the 11th of May last, I have the honour, by command of His Excellency the Governor-General, to convey to you, and through you to the members of the Association of Ontario Land Surveyors the grateful thanks of His Majesty The King for the sympathetic and loyal message forwarded with your letter of the 10th of May, 1901.

I have the honour to be,

Sir,

Your obedient servant,

P. Pelletier.

Acting-Under-Secretary of State

Villiers Sankey, Esq.,

Secretary-Treasurer,

Association of Ontario Land Surveyors,

City Hall, Toronto.

MEMBERS IN ATTENDANCE AT THE NINTH ANNUAL MEETING.

FEBRUARY 26TH, 27TH AND 28TH, 1901.

Geo. B. Abrey.
W. R. Aylsworth.
E. G. Barrow.
David Beatty.
C. D. Bowman.
H. J. Bowman.
W. A. Browne.
M. J. Butler.
Willis Chipman.
Allan Ross Davis.
John Alton Davis.
James Dickson.
H. L. Esten.
J. D. Evans.
R. P. Fairbairn.
W. B. Ford.
K. Gamble.
J. Hutcheon.
C. A. Jones.
G. B. Kirkpatrick.
R. McDowall.
H. McGrandle.
W. A. McLean.
C. J. Murphy.
H. B. Proudfoot.
V. M. Roberts.
James Robertson.
George Ross.
V. Sankey.
H. DeQ. Sewell.
W. V. Taylor.
J. W. Tyrrell.
A. J. VanNostrand.
A. P. Walker.
J. W. Warren.
J. F. Whitson.
Wm. Spry.
L. B. Stewart.

RESULT OF ELECTIONS FOR 1901-1902.

President.....James Dickson.....(by acclamation).
Vice-President.....W. R. Aylsworth.....(by acclamation).
Secretary-Treasurer.....Villiers Sankey.....(by acclamation).

Members of the Council of Management elected for the ensuing three years:

J. W. Tyrrell. John McAree.

Auditors for the ensuing year: (by acclamation).

Capt. Gamble. A. J. Van Nostrand.

I declare the above named officers elected.

VILLIERS SANKEY,
Secretary-Treasurer.

Certified correct.

J. F. WHITSON,
H. L. ESTEN, } *Scrutineers of Ballots.*

Under Sec. 16. Chap. 180, R.S.O., 1897 the Council appointed Mr. C. A. Jones to fill the vacancy caused by the resignation of Mr. W. R. Aylsworth as member of the Council.—*Secretary.*

REPORT OF THE COUNCIL OF MANAGEMENT FOR THE YEAR 1900.

The Council during the year held its regular meetings as prescribed by the Statutes.

Mr. James Dickson having been appointed vice-president on the death of the late F. L. Foster, the Council, under Section 16 of the Act Respecting Land Surveyors, appointed John McAree, of Rat Portage, as member of the Council.

Messrs. B. J. Saunders and Maurice Gaviller were reappointed members of the Board of Examiners, their terms of office having expired. Mr. M. J. Butler's term of office, to which he was nominated by the Lieutenant Governor in Council, has just expired.

No By-laws were passed during the present year.

Progress has been made towards supplying a reliable Standard for Surveyors. The Secretary-Treasurer has been in correspondence with a firm and will bring the subject before the Association in a separate paper. Meanwhile it may be satisfactory to state to the Association that the Standard Bar in the custody of the Secretary of the Board of Examiners made by Messrs. Troughton and Simms, is probably the most reliable Standard in the Province to-day, it having been compared with the Standard in Great Britain, and also having been compared with the Standard in Ottawa, and its exact value given in an indenture, under the hand of the Commissioner of Standards at Ottawa.

As regards unlicensed practitioners, the Council has had under consideration, letters from several Surveyors and it has taken action on one and placed the matter in the hands of a legal firm for prosecution. This is a case in which it appears there ought to be no difficulty in obtaining a judgment, and it has been thought better to defer the others until this case has been decided.

Respectfully submitted,
GEO. B. KIRKPATRICK,
Chairman of Council.

Toronto, February 27th, 1901.

DISCUSSION.

Mr. Kirkpatrick:—The case referred to is one relating to an unlicensed practitioner. The Council of Management has in-

structed a firm of lawyers to take the matter up and prosecute him; and we are advised that we have a very good case.

Mr. Sankey:—The man referred to is named Poitvin, down east of Ottawa. The case is in the hands of a very well-known firm of lawyers in Ottawa, and I had a letter from them yesterday morning saying they have six instances in which the man has run lines and been paid for them. They feel perfectly convinced they can convict him. This is not the first time his name has been reported to the Association; he has been going on with this work for a long time, but he has always evaded the service of papers on him. But Mr. Lewis has taken the matter up and made personal efforts to find the exact details of what the man complained of has been doing. While in Ottawa I intend to see how far our solicitors have gone, and to urge them to go on with the case because there is no question we have a case now worth while taking up. The difficulty before was that Mr. Lewis and some others seemed to think the local Surveyors should be the prosecutors, and the local men did not wish to take that position. The moment I learned that was their difficulty I informed them that the Registrar of the Association was the proper person to take up the prosecution, and that the prosecution should be made in the name of the Association. A prosecution in the name of the Association would be much more effective than if it were in the name of an individual surveyor.

There is another case reported at Powassan, but we thought it would be advisable to wait till the result of the other prosecution became known and possibly then, having secured one conviction, the other one could more easily be effected.

REPORT OF THE BOARD OF EXAMINERS.

The following is the report of the Board of Examiners:

The Board of Examiners met at the office of the Hon. the Commissioner of Crown Lands, on Monday, February 11th, and the following days, as provided by statute. The following candidates passed the required examinations:

FINAL:

Jackson, James Herbert, city of Windsor.

PRELIMINARY:

Adams, Charles F., city of Brantford.
Code, Richard Stanley, Alvinston.
Greenlees, Alexander Hunter, city of London.
Brian, Michael Edward, city of Windsor.
Clark, Charles B., London township.

Bonds of the following Land Surveyors were approved and filed, in accordance with the provisions of the Act:
MacPherson, Charles Wilfrid.
McNaughton, Finlay Donald.
Stull, William Walter.
Fairchild, William Howard.
Shaw, John Henry.
Weeks, Melville Bell.

The following Articles were filed by the undernamed pupils with the undernamed masters:

NAME OF PUPIL.	NAME OF SURVEYOR.	RESIDENCE.	DATE OF ARTICLES.	TERMS.
Clark, L. O.....	Farncourt, F. W. ..	London, Ont. ..	Feb. 16, 1900	Three yrs.
MacCallum, A. J. ..	Robinson, T. J.....	Barrie, Ont....	May 15, 1900	One year.
Russel, W. B.....	Shaw, J. H.	North Bay, Ont.	June 25, 1900	One year
Holcroft, H. S.	Speight & Van Nostrand	Toronto, Ont...	May 17, 1900	One year.
Law, E. H.	DeMorest & Sylvester	Sudbury, Ont..	Jan. 17, 1900	One year.
Bray, L. T.	Bowmay, H. J.....	Berlin, Ont....	Sept. 1, 1900	One year.
Anderson, W. B....	Wilde, J. A.	Sault Ste. Marie	Nov. 24, 1900	One year

In the case of Mr. Holcroft, the Board of Examiners, under the provisions of Sec. 29, R.S.O.C. 180, allowed him to make a break in his term of service, in order to take a post-graduate course at the School of Practical Science.

Respectfully submitted,

GEORGE B. KIRKPATRICK.

Chairman of Board.

Toronto, February 27, 1901.

Moved by Mr. Kirkpatrick, seconded by Mr. Dickson, that the report be received and adopted. Carried.

SECRETARY-TREASURER'S REPORT.

DISCUSSION.

Mr. Dickson moved, seconded by Mr. John Davis, that Mr. Van Nostrand be appointed as auditor in the place of Mr. H. J. Browne. Carried.

Mr. Sankey:—The general tenor of the report is almost identical with that of last year; so many fees paid and the accounts have all been passed by the Council. It is simply a matter of putting the accounts into a list. There has been no extra expense this year except the publication of the Manual, which cost us about $180 for printing and binding. As you will remember, the Manual was distributed early in the season. The expenses of the Council have been about the same as last year; and the expense of the Board of Examiners something less than last year. The fees are practically paid up as well this year as they were last year, but some few members are in arrears for several years. However, other members who had been seriously in arrears have been able to send their money in. Taking one thing with another we are in about the same position as last year.

Mr. Gibson:—How does the balance stand now ?

Mr. Sankey:—Roughly speaking, two or three hundred dollars to the credit of the current account.

President Ross:—And what is the amount in the Savings Bank ?

Mr. Sankey:—We had to draw from the Savings Bank in the early part of the year to pay for the Manual; and, you may remember, there was a grant made to the patriotic fund last year which took the cash out of the treasury in the early part of the year. But now, the fees in the last three or four months have been coming in most satisfactorily, and in cases which I really despaired of I have been very pleased to get bank drafts for a considerable amount of money from certain members who find it is in their interest to be paid-up members of the Association.

Mr. John Davis:—I would like to ask why it is that the report of our Proceedings is so long in appearing. I notice it is in the neighborhood of Christmas before we get the report, and that seems to me to be an extraordinarily long time for the printing of a document like ours. Perhaps there is some reason.

Mr. Sankey:—The difficulty we experienced this year was largely due to the long time it took to get the proofs of some of the papers corrected by the gentlemen who contributed the papers. Some of the papers had to be sent to the men who wrote them but who were not present at the meeting, and it took them a long time to send them back to us. One of the papers had to be recast before being printed. And the printers delayed me five or six weeks; I did not get the reports from them till October; and then we commenced sending them out. I know a great many were posted in October and November and some gentlemen here to-day say they have not yet got them. This was to me the first intimation that they had not been received by those to whom they were sent. The only way I can account for it is that the wrappers were torn off. I am informed that in the Hamilton Post Office several were found without the wrapper on, although I had used the same wrapper as has been used heretofore. I do not know whether that was because of the rougher handling they received; but to provide against the possibility of that I have now adopted a heavier wrapper. Being new to the business I did not know how close

one has to watch printers, and authors of papers and everything else in order to get the thing out in proper shape. Another year it will not take me so long.

While speaking on this matter I would say that it is only in the last three weeks I have received any more of our exchanges from the States. In fact three of them came during the week of the meeting of our Board of Examiners, and they are up now in our Repository ready for mailing. The people on the other side of the Line, with whom we exchange, seem to have had the same kind of delay we have had.

President Ross instructed the Secretary, Mr. Sankey, to send his report on to the Chairman of the Council.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

Mr. President.—Your Committee on Repository and Biography, beg leave to report as follows:—

As foreshadowed in the report of this committee for the preceding year, the change of rooms for the use of the Board of Examiners and the Association has been made, and the great improvement in our accommodation is too evident to require notice, further than as recognition of the generous treatment we have received at the hands of the Honorable, the Commissioner of Public Works. In addition to the advantages for the purpose of meeting, the three rooms now under our control are available for committee meetings, and for the use of individual members, who have occasion to copy plans, etc., of record in the Department of Crown Lands.

It is expected that during the coming year, further improvement will be made in this direction.

A considerable number of additions have been made to the number of works in the library, and a new catalogue will shortly be required.

The Biographical section of the committee has now more or less complete sketches of the following Surveyors:

Mahlon Burwell, Milton C. Schofield, John Farquharson, Richard Birdsall, E. C. Caddy, Aaron Greely, D. O'Reilly, Samuel Ryckman, Peter Carroll, John S. Aylesworth, J. D. McNabb, P. N. Hyndman, William Robinson, Samuel S. Willmott, J. Nepean Molesworth,, David Gibson, John A. Tidy, Thos. W. Walsh, Eliakim Malcolm, Jas. Kirkpatrick, Augustus Jones, John McDonald, J, Stoughton Dennis, William Campbell, Henry Strange, Thos. A. Blythe, Hugh McMahon, John Stigman, Robert Synee, Charles Rankin, T. C. Keefer, E De Cew, Hugh Black, Henry Ewing, S. M. Burson, J. M. O. Cromwell, Hon. A. Yidal, H. DeQ. Sewell, Francis Bolger, C. J. Wheelock, Jos. Kirk.

Some of these sketches are complete, whilst others are mere outlines. It has been suggested that with the above list in printed form, additions may be made by members who can recall incidents in the lives of many of those enumerated, and thus add to the collection of data.

An interesting collection of photographs has been begun, and your Committee would take this opportunity to solicit contributions of biographical sketches and photographs of members who have not already accepted previous similar invitations.

Respectfully submitted,

A. J. Van Nostrand.

Chairman.

REPORT OF PUBLICATION COMMITTEE.

Mr. President,—Although your Committee commenced their labors soon after the Annual Meeting, our Report was not published as soon as we expected. There was considerable delay in the correction of the "proofs" of some of the "papers," as the whereabouts of the authors was difficult to obtain; and a good deal of time was taken up in redrafting nearly all the illustrations.

We were unable to obtain a suitable biographical sketch for publication.

1,350 copies of the report were satisfactorily printed by Messrs. Henderson & Co., at a cost of $374.42.

We desire to call the attention of the members of the Association to our advertisements.

We exchanged Reports with the following Societies:

School of Practical Science Engineering Society	150
Michigan Engineering Society	125
Ohio Society of Surveyors and Civil Engineers	125
Illinois Society of Engineers and Surveyors	135
Indiana Engineering Society	100
Iowa Civil Engineers' and Surveyors' Society	85
Wisconsin Engineering Society	
Purdue Society of Civil Engineers	

Respectfully submitted,

Killaly Gamble

Chairman.

February 27th, 1901.

REPORT OF THE COMMITTEE ON LAND SURVEYING.

Mr. President,—Your Committee on Surveying have nothing special to report this year.

Six papers, containing questions, have been under the consideration of the Committee, and they beg to submit the following conclusions; for your examination and adoption or amendment.

Your Committee also considered Mr. John McAree's communication on the subject of an "Ontario Manual of Surveys," and beg to recommend that the same be referred to the Council with a request that the Council will take action thereon, and have Mr. McAree's ideas carried out if possible.

All of which is respectfully submitted,

Wm. R. Aylsworth

Chairman.

Feb. 27, 1901.

QUESTION DRAWER.

Ottawa, February 21st, 1901.

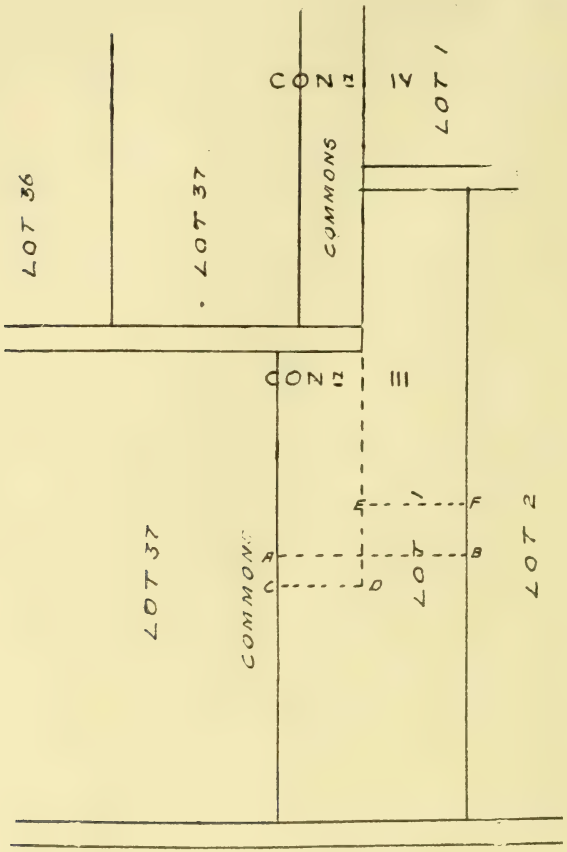
Mr. V. Sankey:—

Dear Sir,—I regret to say that I shall be unable to attend the O. L. S., annual meeting next week but I enclose a question which came up in my practice a couple of months ago. I would like to have the answer of the Surveying Committee at as early a date as possible, and would consider it a favor if you will attend to it for me.

Thanking you in anticipation,

I am yours very truly,

A. J. McPherson.



The above diagram shows the boundaries of Lot I in the 3rd Con., of a single front concession Township in Ontario.

How would the dividing line between the north and south halves be run ?

Would it be as shown at A B, or C D E F, C and F being the middle points of the side-lines of the lot ?

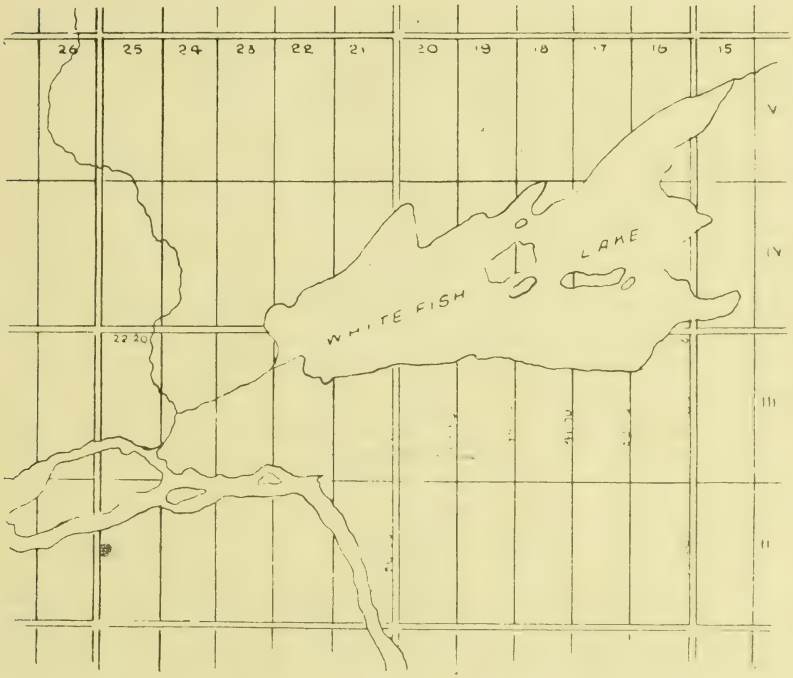
Ans.—Draw line A B on a mean course between the north and south ends of the lot so as to divide the lot into two equal parts.

Eganville, February 23rd, 1901.

W. R. Aylesworth, Esq., O. L. S.,
Chairman Committee on Question Drawer.

Dear Sir,—I enclose Sketch of part of Township of Brougham, surveyed 1871, Sectional system.

On the ground I found line between lots 15 and 16, where it was intersected by line between Concession III and IV, I traced both lines for a considerable distance, but found that instead of it being seven chains on concession line, and two chains on side-line from roads to water as shown in Field Notes, the distances on ground were about 14 chains and 8½ chains re-



spectively. From Field Notes it is doubtful whether posts were planted on south side of Whitefish Lake, though the inference is they were, and one old settler says he saw one of them, *i.e.*, between 16 and 17. I want to know how you would proceed to run lines between lots 16 to

20 inclusive and to establish blind line between concessions II and III in this block. The old posts at intersections of Road allowances between concessions III and IV, lots 25 and 26 are standing; no other posts can be found between these and intersection of concession with line between 15 and 16. I found width of lots 16, 17, 18, 19, 20, 21, 22, 23, 24 and 25 to be 200 chains .04 links, instead of 204 chains .60 links, as shown by Field Notes.

There is not any allowance for road around Whitefish Lake.

Trusting that this is not too late to receive attention of your committee, I remain,

Yours truly,

HERBERT J. BEATTY.

ANS.—1. Connect points or posts that can be found on concession-line, 3rd and 4th concessions east and west of Whitefish Lake by a straight line; and points on side-road line 20 and 21, south and north of Lake by another straight line, measure distance from intersection of said lines to line of side-road 15 and 16, deduct half width of side-road and divide remainder of distance proportionally into five lots:

2. Divide distance from said intersection on line 20 and 21, to line 1st and 2nd concessions equally, also divide length of 2nd and 3rd concessions on line 15 and 16 equally, and then draw straight line between these middle points from rear of 2nd concession lots.

NO. 3.

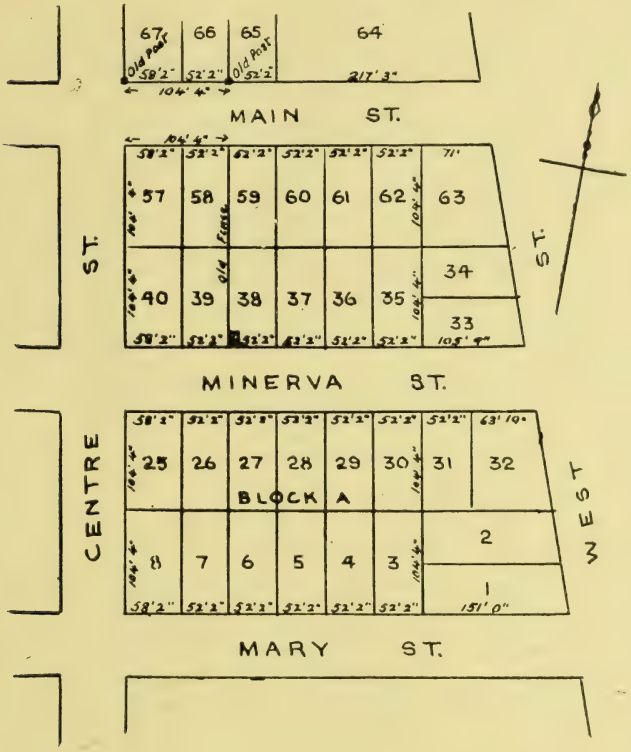
Huntsville, Ont., February 5th, 1901.

The accompanying plan shows part of the Town of Huntsville, surveyed in June 1876 and plan registered on the 22nd August of same year. The said plan shows the lots adjoining the east side of Centre Street to have a frontage of 58 feet 2 inches, and all the other full lots a frontage of 52 feet 2 inches. There is an old post between lots 65 and 66, an old fence between lots 58 and 59, and there was a stable erected in August 1876, on the south-west corner of lot 38, leaving a distance of 104 feet 4 inches between each of said land-marks and the east

limit of Centre Street. How should the lines between lots 39 and 40, lots 57 and 58, and lots 66 and 67 be established ?

How should lines between lots in Block A be established ? No old land-marks being found.

HUGH MCGRANDLE.



ANS.—1. Give each lot 66 and 67, its proportion according to Field Notes of whole width on ground of both lots.

2. Find point on south side of Main Street between lots 58 and 59 from original post 65 and 66 on north side of Main Street, and give 58 and 57 each its proportion of width on ground. (Vide. section 37 and sub-section 2).

3. The old stable without further evidence is not sufficient to establish that corner.

4. The boundaries of Block A. must be first fixed and then the block divided according to the original Field Notes or plan.

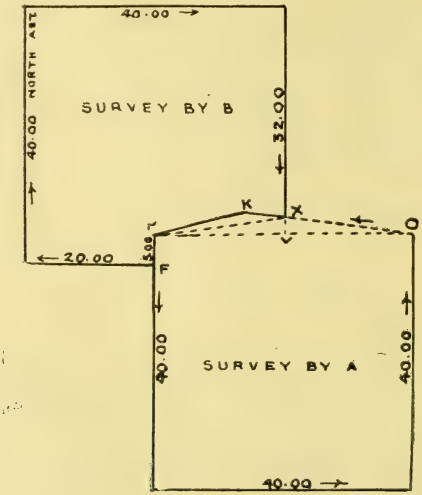
For answer to your next question with diagram, see answer to Question 2 above.

No. 4.

LAND SURVEYING, MINING LOCATIONS.

In a bush survey, Surveyor A, in order to hit the post exactly, when closing along his northern boundary, turns off an angle at K, from which point the post probably first became visible.

Surveyor B, on a subsequent adjacent survey begins at F, and in closing to the south on his eastern boundary is startled to find a cut line at X. Should Surveyor B stop at X and go round via. K to P, or locate Y on the alignment OP and cut the line from Y to P ? If the former, should he not plant a post at K also ? In any event if a fire should obliterate all the lines, leaving only the pyramids of stones at the corners, would not O—P be the N boundary of A's survey ? If a corner be placed at X, then possibly O X P would be the final result ?

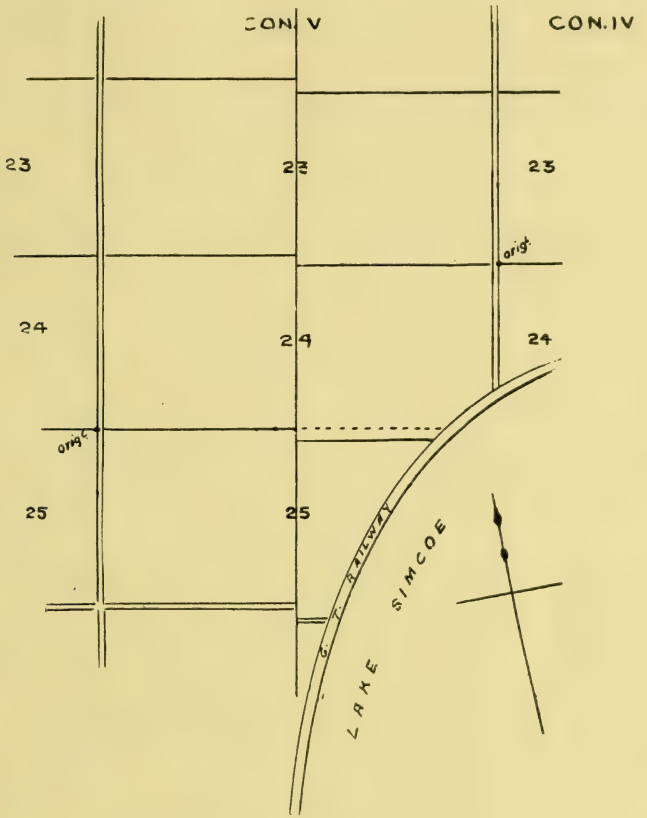


ANS.—More data is required for complete answer; but if Surveyor A ran the line O K P and it can be proven that he did so we think it must stand.

Collingwood, August 21st, 1900.

P. S. Gibson, Esq., O. L. S., Willowdale, Ont.

Dear Mr. Gibson,—I have a question of boundary on hand, on which I would like to get your opinion, as I have not got the dates of the old amendments to the Survey Act.



The case is as follows:

In 1838 the boundary between the east halves of lots 24 and 25, concession V (see diagram enclosed), was fixed giving a jog on the blind line of concession V.

This survey was confirmed by H. P. Savigny, P. L. S., in 1854, and it appears also by Gibbard and Robt. Ross, P. L. S's. In 1872 or 3, when determining titles for the Muskoka Extension Railway, P. L. S., A. C. Thompson, in conformity with Section

31 Survey Act, ran a line from the post in *Rear* straight through to the lake leaving no jogs.

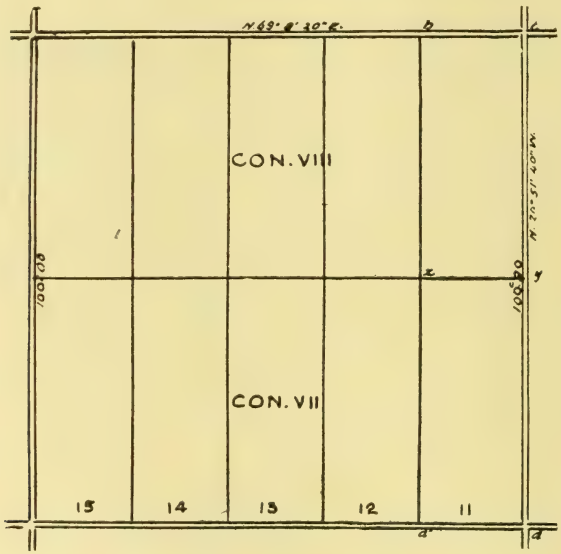
Qu.—Was there anything to permit the first survey giving jog in the centre of the concession?

We want the matter settled without law-suit.

Yours sincerely,

M. Gaviller.

Ans.—Line should be run from rear of 5th concession straight to the lake. (See last part of Section 31).



No. 6.

Sudbury, Ont., January 22nd, 1901.

W. R. Aylesworth, Esq., O. L. S., Belleville,
Chairman L. S. Committee, O. L. S. Association.

Dear Sir,—I herewith submit a question for discussion by your Committee.

How would you run the rear line of any or of all the lots in this block?

This is in a Township mentioned in (Sec. 28, sub. 2), wherein it is enacted that all lines must be run on the astronomic bearing as shown in original Field Notes.

It has been my practice so far to run rear lines on a course to intersect side lines of lots in the middle, presuming that Sec. 28 (2) only refers to side lines of lots, but I do not see that the section covers this.

Yours truly,

L. V. Rorke.

Ans.—We think Sec. 28, S.S. 2, only refers to side-lines of lots—and rear line of lot No. 11 in 7th concession, should be run, if original Field Notes show that to have been the intention, from middle point on c. d, to middle point on a. b. (Vide Sec. 34).

REPORT OF COMMITTEE ON DRAINAGE.

Mr. C. A. Jones:—Mr. President, and Members of the Association, Mr. Code, the Chairman of the Committee on drainage, is not present to-day, and in his absence the Secretary has asked me to read the report.

Mr. C. A. Jones reads the report as follows:—

TO THE ASSOCIATION OF ONTARIO LAND SURVEYORS:

Gentlemen,—That the work of drainage has not diminished during the past year, and that litigation has not decreased, appears to be the conclusion of a number of members of this profession, whose practice is composed largely of drainage work.

It would involve considerable labor to review the drainage works of importance and decisions respecting drainage cases, and it has been before suggested that the reports and decisions on drainage cases might be published at nominal expense, by the Provincial Government, in which suggestion many concur.

The provisions of The Drainage Act are being gradually defined by decisions of the courts, but the enormous cost of such, suggests that some change should be made in the procedure, upon which final decisions are given.

The main questions as to usual, " Benefit," " Outlet Liability," and " Injuring Liability,"—and of note among opinions expressed in cases decided in the past year is contained in " Notes for Judgment of the Court, delivered by Gwynne, J., *re* Sutherland Innis Co., v, Romney," an appeal from a judgment of the Court of Appeal, of Ontario, affirming a judgment of the High Court, dismissing an action instituted by the appellants, in which the learned Justice states:

. . . . . " Then in Sec. 3, sub-section 5, is enacted, the mode by which the amount to be charged to each particular lot to be assessed is to be determined.

A careful consideration of the Act therefore condemns, in my judgment, as wholly inadmissible, a construction which should hold that lands not benefited by a drainage work constructed under the provisions of the Act, are nevertheless made liable to assessment, for " Injuring Liability,' or " Outlet Liability,"—notwithstanding the words in the third section, purporting to authorize the Engineer, to make an assessment of the lands and roads within said area, to be benefited, and of any other lands and roads liable to assessment as hereinafter provided. The provisions coming under the term " as hereinafter provided," seem, I think, to favor rather the construction that what the Legislature intended was, to provide in the interest of the persons to be assessed, that the sums should shew the nature of each item charged separately, as follows:—First, for " Benefit," meaning I apprehend thereby, (for no interpretation is given to this word in the Act), the benefit conferred by the facility for the drainage of all lands within the area of the drainage work; which benefit would vary according to the difference of elevation of the respective lots:—the quantity of water to be drained from each; the distance of the several lots from the drainage work, and the like.

Secondly:—For " Injuring Liability," that is to say for the special charge to each lot from which water is caused to flow to the injury of other lands in the manner described in the Act, under definition of " Injuring Liability." The whole cost of that work, in so far as it relates to the removal of this water is to be borne specially by an assessment upon the lots for which the water doing injury is so caused to flow.

Thirdly:—For "Outlet Liability," which is only authorized to be assessed for in the one particular case of a drain constructed in one Township being continued into another until a sufficient outlet for the waters coming down such drain is reached.

The application of the same precise mode for determining the amounts chargeable for "Injuring Liability" and for "Outlet Liability,"—does not appear to be, I think, quite felicitous. The best mode of applying that sub-section to "Outlet Liability" would seem to be, first—to determine the total amount chargeable for "Outlet Liability," by a calculation based upon the volume in which, and the speed at which the water comes down the drain to its outlet in another Municipality, than that in which the drain is initiated, and secondly; to apportion that sum among the several lots from which the water is caused to flow by artificial means from the lands assessable into the drains upon a calculation, based upon the volume in which, and the speed at which such waters are respectively so caused to flow into the drain. In any case all lands from which no water is so caused to flow into a drain, having its outlet in another Municipality than that which the drain was initiated, would be exempt from assessment."

To compile a report to agree with the enactment of the Drainage Act, with the various interpretations placed upon such by the different courts is a work requiring considerable ability and the necessity of a personal inspection of each particular parcel is apparent from decisions on appeals to the Drainage Referee, and the Higher Courts.

Work under the Ditches and Watercourses Act is apparently in no better condition than formerly to judge from the opinions expressed by members.

Some time ago, Sec., 28 of this Act, relating to the non-completion of work was amended by inserting the clause, "or at any time, not later than six months after the time fixed for the completion of the ditch."

The working of the entire Act is blocked by this insertion, after the time limited has expired, and the Engineer has no authority to let the uncompleted parts, and the only course clear is a new award with its attendant risks.

An extension of time should be made, or the clause omitted entirely.

Though it is evident, we will not see changes effected until

after extensive litigation, it is still wise to work under Acts as they are, and to follow carefully the decisions of the courts relating to the various sections.

A. S. Code,
Chairman of Committee on Drainage.

February, 27th, 1901.

DISCUSSION.

Mr. Sankey:—The case referred to in that report is the Sutherland Innis Company, plaintiffs, against the Township of Romney, and is reported in volume 30 of the Supreme Court of Canada Reports; this was an appeal from the Court of Appeal of Ontario. The report of the judgment commences at page 495 and concludes at page 535.

Mr. Jones:—Mr. Sankey has suggested having a number of copies of this report struck off in typewriting and sent to those who are most interested in drainage matters and ask them to send in their opinions or suggestions in regard to it.

Mr. Aylesworth:—I think if the case were cited in the Committee's report that those interested could get access to the law libraries and see the report as it is published in the Official Court Reports.

Mr. Sankey:—I was going to suggest getting five or six typewritten copies, which would not be a very expensive matter, and they could be forwarded in the form of a circular letter to those members of our Association who are more intimately connected with drainage, and each one asked to send in a small digest of his ideas, and to say whether in his opinion it would be interesting to the members at large to have this printed or to have a digest of it in our annual report. Of course the case would be cited any way; but possibly it might be difficult for some members to get hold of these Supreme Court Reports; in the large towns and cities they could be got at, but in the country it would be more difficult. I think it would be a little work for the new Drainage Committee to tackle in the early stages of their year if they were to give us a digest on the matter for publication in our next annual report.

The President:—It would not cost much more to print the whole report in full, than to make typewritten copies, and if printed in full it could be sent out to all our members.

Mr. Sankey:—Several members are not interested in drainage at all. If we sent it to the drainage men, those most interested, six copies would go a long way; and if they would send us a digest on the result, I think we would get up a very useful addition to our next year's proceedings.

The President:—Almost every member is liable to have drainage cases.

Mr. Sankey:—Just printing that without any remarks would not be of as much use as if we had the opinions of men qualified to give opinions on the matter, and then publish the whole thing together. Still, if the Association desires to publish the whole of it, the expense does not amount to a great deal, and a matter of expense should not deter us from doing it.

Mr. John Davis:—Would it not be better to refer it to the Drainage Committee and let them prepare a digest of it ?

Moved by Mr. John Davis, seconded by Mr. Evans, that the report of the Drainage Committee be received and printed in the Minutes; and that the Drainage Committee be asked to prepare a digest of the case cited in the Committee's report which should also be printed in the Annual Report. Carried.

DISCUSSIONS.

STANDARD OF MEASURE.

Mr. Sankey:—I see that Mr. M. J. Butler is in the room. I had hoped that he would have been here this morning to hear what was said with regard to the standard of measure. We have a few minutes yet before the time for hearing Captain Bernier's lecture, and I would suggest that the time be filled in by a few remarks from Mr. Butler.

Before I take my seat I would like to say in reference to the proposed Standard which was presented, and which is in feet and 10ths, and links and 10ths, that a member of the Association suggested that before this Standard would be worn out, or before the value of it would have been earned by the surveyor who had it, the metric system would probably be adopted, and that we must not be too quick in adopting the old-fashioned Standard. I make these remarks because I know that Mr. Butler has a good many ideas on matters of this kind.

Mr. Butler:—I had intended on the discussion to touch upon the origin of the British Standard, and to show the manner in which it was fixed. But Mr. Sankey suggests that I just deal for a moment with the metric system, as distinguished from ours. Some years ago—in 1885—there was a paper laid before the Institute of Civil Engineers in England, by which it was sought to show the advantages of the metric system, and the disadvantages in the way of loss and trade those using the British and English measures throughout the world were suffering from because of their failure to adopt the metric system. At that time I had no personal experience in the matter, except in a little way, from an academical standpoint; and it did seem to me the criticisms of those who were in favor of retaining the English system were simply evidences of the conservatism of Englishmen and that hundreds were more in favor of the metric; but since that time I have had some work to do under the metric system, and I found it involved a good deal of calculation; and as a result

of that experience I am not in favor of the general application of the metric system to engineering contracts. The changes that would be involved are so great as to practically render the whole of our accumulated engineering literature valueless. That in itself is a very serious matter. I do not think there is a lathe, or a screw or a bolt or a single one of the essential elements that go to make up a machine, or a bridge, that could be converted from the one measure into the other. We would simply have to abandon our present standard of measure, and by using perhaps data that is accumulated for a convertible unit, start all over afresh and not attempt to make use of conversion tables. It is a delusion and a snare to think you can take a conversion table and fit the English system into the metric or vice versa. The difficulties are such as would overwhelm a man even to attempt.

Besides this, I think in the training of the mind one of the most valuable things a man can learn is to use mental arithmetic well, but most men who attempt to multiply two or three decimals together mentally will find out they cannot do it. If you attempt to multiply ⅛ by ⅛ in the decimal system you have .15625 and so on, and who can multiply these mentally ?

I think the remarks I have to make are better stated by Sir Frederick Bramwell who discussed the question before the Society; and as the discussion only occupied a few pages I will just read to you what he says: " Sir Frederick Bramwell, President, said he wished, before the close of the meeting, to ask the indulgence of the members for 0.0833, or it might be 0.1666 of an hour. What was the object of a system of arithmetic ? He supposed that it was to be able to make calculations in the easiest manner, and to arrive at sufficiently accurate results.

That is just the point here. I think that one of the most sensible things an engineer can learn is to learn within what limits a measure is reliable. One of the first things he wants to do is to drop three or four places of decimals. The metric system has a tendency to make him go to, not three or four but ten or twelve. I think any finely subdivided recurring decimal of this kind is something we should try to get away from.

" The question, therefore, was whether the system in use in England, or that in use on the Continent, was the more likely to satisfy these conditions. He felt inclined to say, from many years' consideration and experience, that the English system was the more likely to give this satisfaction. Of course a mere

statement of opinion, if unsupported by facts, was of no value, and he therefore desired to give one or two reasons for the faith that was in him. He wished to be allowed to use the decimal system with English weights and measures when he liked, and to use vulgar fractions when he liked. At the present time the metric system was permissive in England, so that any one could use it when he pleased; but he presumed that the object of the author was to have an Act—a compulsory Act—which should forbid the use of the present English weights and measures. What would be thought by the advocates of the metric system, if those who preferred English weights and measures were to introduce a Bill for the purpose of prohibiting the metric and the decimal method. They would, no doubt, look upon such a measure as being very wrong and improper, and he must be permitted, on the other hand, to regard the introduction of the Bill to compel the use of the metric system as being equally wrong and improper. His hearers must not suppose that the advocates of the metric system were not amenable to the charge of seeking to make the continual use of the existing system a crime. The Bill brought in by Messrs. Ewart, Bazley, Baines, Smith and Graves, on the 24th of February, 1868, contained the following penal clauses:"

Then it went on to recite that the metric system must be used, under a penalty and forfeiture of the price if the English system was used.

" There must indeed be an extreme superiority of one system over the other, to justify an enactment that would cause a man to be considered a breaker of the law and liable to penalty simply because he chose to make his calculations by the old method instead of the new one. All that he asked was, that liberty should be left to people to make their own selection, and he thought if that liberty were continued it would be easy to foretell the result. The permission to use the metric system as a legal measure had existed in England for some years, and in the United States for a still greater number of years, but it had not been adopted; whereupon the advocates of the metric system, not content with leaving it to the selection of the people to use that which was most convenient, wanted to force their particular mode upon them by means of penalties. To come now to a consideration of the relative advantages of the two systems.

What were the facts? The Author had spoken of "stones," "drams," "scruples," and so on; but such measures were not used by engineers. He had ridiculed the scale of three-sixteenths of an inch, but, as had already been pointed out, that was one sixty-fourth of a foot, and he believed that his mind was as capable of grasping the idea of one thing being sixty-four times the size of another as it was of being impressed by the motion that the relative dimensions of two objects were 1 and 100. The Author had brought forward a pair of calculations to illustrate the general superiority of the decimal-metric system above the existing English system; but in one sense, and in one sense only, was this calculation that had been placed before them typical of the metrical and decimal system—in the enlarged copy on the wall the decimal point appeared in the wrong place, as it always did."

The comparison that was put on the wall simply showed the different calculations necessary to find the weight of water in a tank measuring 10 ft. 6 ins. by 6 ft. 2 ins. by 1 ft. 1 in., by the English system as compared with the metric system. The calculation shown on page 44 of the report I have referred to, and is as follows:—

"To find the weight of water in a tank measuring:—

Table A

Ft.	Ins.		Ft.	Ins.		Ft.	Ins.			M.		M.		M.
10	6	x	6	2	x	1	1	(or)		3.20	x	1 88	x	0.33
	10.5													3.2
	6.17													1.88
	735													256
	105													256
	630													32
	4 785													6 016
	61.083													0.33
	194355													18048
	518280													18048
	647850													
	4)70162.155													1.98528 tons.
	4)17540.538													

4)4385.134

7)1096.283

4)156.611

20)39.152

1.957 ton.

That example on Page 44 shows a little more in favor of the metric system in the calculation as the author reduced it to decimals and that makes the English calculation look a very large one and the metric one a very small one; but it will illustrate the point which Sir Frederick Bramwell makes. He says, "Some years ago he went into the workshops of the Paris and Lyons Railway, where he was shown a drawing of a locomotive, with a variable blast-pipe, and he asked what was the maximum and what the minimum area. One of the engineers took a sheet of foolscap, covered it with figures from top to bottom, and then gave him a dimension rather bigger than that of the cylinder. Sir Frederick Bramwell had a two-foot rule in his pocket, and, finding that the drawing was made on the scale of one-tenth, he applied the English inch tenth, and so got out the area and translated it into French measures, which he did in one-fifth part of the time occupied by the man figuring on the paper. He did not displace the decimal point, because he had not got one. Reverting to the calculations on the wall, he wished to show how utterly misleading they were. The Author had placed before the members two comparative calculations, employed to ascertain the weight in tons and decimals of tons of the water contained in a given sized vessel. In consequence of the bulk of water representing the weight in French measures he was enabled to stop in his calculation on arriving at the cubic contents, and to say, "The whole thing is done; there is the weight of the water; but if you do it in English measurements you will have all these additional figures to use before you can get the weight of the water." Assume for the moment the difference in the length of the two calculations existed, what did it prove as regard the general question? Nothing whatever. To what did it apply? To fresh water at a particular temperature, and to nothing else. There was no other liquid on the face of the earth, from ether to mercury, for which it would be true. It was not true for salt water, nor would it even do for fresh water at a different temperature. In any other case a multiplier must

be used to get the weight, which would make the metric calculation as complex as the Author's English example. But who but one whose mind was warped by the metric system would have thought of turning inches into decimals of feet prior to calculation. Would not any one else have worked the sum thus— ?"

And then he works it out by the duodecimal system as follows:—

```
   10.6
    6.2
-------
   63.0
    1.9
-------
   64.9
    1.1
-------
   64.9
-------
    5.4.9
-------
   70.1.9
```

"Let any one go to a French railway station, and ask for three tickets from A to B, and it would generally be found that the man (or, as was commonly the case, a woman with a man to look after her) could not tell the amount without taking a piece of chalk or a pencil and making a calculation. The clerk would have no more idea of what three times the single fare was than a child would have. Compare such a person's power of calculation with that of an English butcher's wife or daughter who was in the habit of dealing with pounds and ounces and pence. Let him test the question nearer home. Could many of those present mentally square 3.25 ? He believed very few. But there was no difficulty in squaring $3\frac{1}{4} = 10\ 9\text{-}16$. 10 9-16 was a sum easily appreciated and easily expressed, while 10.5625, the decimal equivalent of the vulgar fraction was much more cumbrous, and he ventured to think did not form any impression on the mind, except that it was a little more than one half. Again, which of them could square 4.125 ? That to the majority would be almost impossible, but with $4\frac{1}{8}$ there was no difficulty. 17 1-64 compared with 17.015625. It appeared to him that a system like the present one, which enabled mental calcu-

lations to be made rapidly and accurately, was enough for all practical purposes. . . . . Water had been referred to as an instance of the wonderful use of the metric system. He would take a water illustration of a simple calculation by the English system. If engineers wanted to know how much a pump would lift, what did they do? They squared the diameter and multiplied by the stroke of the piston in yards, and at once obtained the amount in pounds, as every yard upon the circular inch was a pound. Taking an 8-inch pump, the square was 64; it was making 10 yards a minute—64 gallons a minute—there they had it in a moment. Another instance, 1 inch of rain to the acre was 100 tons, or, to be more accurate, 101 tons. In the United States, where, as here, they had the option to use legally the metric system, they had not used it. Mr. Sellers, one of the best authorities, had said that the thing was not fit to be used. He would refer the members to one who was not a bad engineering authority, Rankin. He would read to them the last verse of Rankin's song in praise of the three-foot rule:—

"Here's a health to every learned man that goes by common sense;
And would not plague the workman on any vain pretence:
But as for those philanthropists who'd send us back to school,
Oh, bless their eyes, if ever they tries to put down the three-foot rule."

That seems to me to sufficiently illustrate the standpoint of perhaps one of the best authorities in England, and a very able engineer who knew something of what he was talking about.

Another gentleman, Mr. H. Bauerman expresses the opinion, "As the result of long experience in the use of various metrological systems in different countries, he was unable to agree with the Author's conclusions as to the desirability of internationalizing the metrical system to the exclusion of all others. He thought that the weights and measures used at any particular time by any people fairly correspond to their local and temporary necessities and as new necessities arose, they would be met by the adoption of new, or by the modification of old, units."

I will wind up by a remark from Mr. Ferdinand Hurter, who says, "That the only important reason for a change from the English to the metric system was that many nations had adopted the latter;" and he compares the yard in this way: "It was in the workshop that the English system was superior to the

French; and the English inch was the standard for screw-cutting, not only in England, but throughout the world. It must not be forgotten that the British public was not prepared, nor preparing for such a change. Decimal calculation was unknown to the mass of the people. Boys were allowed to leave school, having passed the fifth standard, void of all knowledge of decimal arithmetic. Surely it would be unfair to take the masses by surprise. But if the metric system must be, let it be the metric system pure, the metric system compulsory; not a metric system at the option of any engineer. Let there be no mixture, particularly in plans to be submitted to, and discussed by, parliamentary committees." (Applause).

SURVEYORS AS REFEREES.

Mr. McDowall:—Mr. President and Gentlemen, I was made referee, by appointment from Judge Masson, in a dispute over a line in the Township of Howick, in the County of Huron. When the appointment reached me I looked up the Act regarding the matter. The first thing in the Act I noticed is that arbitrators are supposed to take an oath before starting, but there is nothing mentioned in the Act about referees taking an oath. I made enquiries of a solicitor, and he thought I had better take the oath. I took it, and sent it on to the Judge, and I sent certified Field Notes of the line in dispute. I came to Toronto and looked over the rest of the Township in close proximity, for fear the notice I received would not cover the country when I arrived on the spot. When I arrived there I found it was a very easy survey indeed; the original stakes were found and proven without much difficulty. The line had been run by two Provincial Land Surveyors, Mr. Bolton, of Listowel, and Mr. J. McNab. There was a difference of some sixteen feet between us at the back. The depth of the lots in question was fifty chains. The bearing line was the County line between Bruce and Huron; and it was between lots one and two, just eighty rods in width. On the front of the lots we almost all agreed within a few inches. At the back I was further south than either Surveyor; I was eight feet from Mr. Bolton and twenty-four feet from Mr. McNab.

The defendant in the case lost. I sent in my bill, estimating my time at $20 a day. They brought my bill before Mr. Thom, the Taxing Officer at Osgoode Hall, to have it taxed; and I attended on the taxation. Mr. Thom cut my bill down some; he gave as his reason for that that I was there as a Surveyor merely, unless I heard evidence on the ground; that I was only the arbitrator in the case of hearing the evidence; and he would only allow me $20 or at the rate of $3 an hour for the time I spent in taking the evidence on the ground. $3 an hour is what the Act calls for. For the balance of the time he gave me $6 a day and my expenses.

Mr. Kirkpatrick:—I did a little better than that. I was appointed Referee by the High Court of Justice in a case of a disputed survey in the Township of Saltfleet, in 1899, under the

same Act. I went on the ground and I took evidence as an Ontario Land Surveyor in the case. I traced up all I could. I took a good deal of the time in doing it because it was very difficult to find anybody who knew anything at all about the original survey, it having been made in 1797. I then examined into the special section of the Act which related to it, and I searched back to find the preamble of the original Bill. I found there the explanation which of course has not been reproduced in the Act giving the reasons why the Act was changed in that particular case, and fully explaining the whole system of survey and how it should be run. I have since found that there is in Mr. Esten's "Disputed Cases," published by this Association, a decision which was made by the Court prior to the date of the introduction of the alteration of the Act; that bore out my survey in accordance with the Act; and if I had only known of it before, it would have saved me much time and trouble. That case had evidently escaped the notice of the Judge, and of the solicitors on both sides and of the Surveyors on both sides as well, because had they had it they could have at once seen the proper mode of procedure in running that line; because the Court had decided prior to the amendment of the Act that such was the proper way to run it. I fancy after that that it was thought better to introduce an amendment which would set out in definite words what the Surveyor should do. That is, in those townships in which the side lines have been run and the concession lines have not been run, that a side line should be traced out on the ground in the same way in which it was originally run in the first survey. In the Township of Saltfleet, I found, by looking over the notes of Augustus Jones, that he ran one side line from the south to the north, and then crossed over and ran the next side line from the north to the south, and so on through the Township. When a Surveyor is called on to run a side line in any Township he has to use the side line in exactly the same way as if it were a concession line, that is, he must find a point, or two points, on the side line through the township and join those to his original work on the ground. That I did, and sent my report to Chief Justice Armour. I sent my bill in charging $20 a day and travelling expenses; and it was paid without a murmur.

President Ross:—The difference between you and Mr. McDowall apparently is your account was not appealed against.

We are very glad to hear the experience of these two members

of our Association, and it will probably prove valuable to other members.

Mr. McDowall:—Where should these reports be filed ?

The Act calls for plans to be filed in the Registry Office. I sent my whole report to the Judge.

Mr. Van Nostrand:—I think, as far as I can learn, the proper place for filing those papers is with the Registrar of the Court in the County in which the action is begun. I had a case last spring—it was not the same kind of case as we have just heard of—under Section 2 of the Act which provides that the parties before the action comes to trial may agree to refer it to a Surveyor, and in that case the Surveyor is practically the Judge; and the plaintiff and defendant, each by his solicitor, have to be heard by the Surveyor as Referee, just in the same way that an ordinary reference is made at Osgoode Hall. In this case there were three parties to the suit, and necessarily three lawyers and they all insisted on all the legal machinery being proceeded with. The witnesses were called and examined by the solicitor calling them, and cross-examined by the other solicitors; and all the evidence was taken in writing and signed by the witnesses after it had been read over to them. Affidavits, such as are usually taken under Chapter 181, would not do there; it had to be oral evidence. The report of the Referee was to be filed with the Registrar of the Court, and it was so filed, and the Registrar forwarded it to the Judge, and the Judge made his finding on that report. I was so fortunate in this case as to have the Judge agree with me; and if our stenographer will only close his ears for a moment I will confess I charged only $15 a day. My bill went through all right and I did not have to attend any taxation. I think in the end that I came out just as well at $15 a day as if I had made it $20 a day and charged for fewer days. I do not, however, desire this to be considered as a precedent for other references.

President Ross:—Did they allow you a stenographer to take the evidence ?

Mr. Van Nostrand:—The solicitors agreed amongst themselves that one of them who was not, as it happened, actively interested in the case should take down the evidence in longhand. He was familiar with that class of work, and he took the evidence down in extenso while it was being given; and it was all signed while the witnesses were yet there. In other

cases it might be that a stenographer would be necessary, and in that case, of course, he would have to be a Court Stenographer or other properly qualified stenographer. The fact that an unofficial stenographer might be able to do the work would perhaps not be sufficient.

I think it a good thing that this matter has been brought before the Association, because it is an Act that has not been made very much use of as yet; it is comparatively new; and cases may crop up at any time. It seems to me that the Act provides the common-sense way of settling these disputes, because they come before the men who are best qualified to decide on the points; and as a rule the courts will hold with what the Referees decide. The expense is considerably lessened in these cases, because the evidence is taken right on the ground instead of going to the expense of bringing all the witnesses to the legal centre. In the case I had, I know a great deal of expense and a great deal of time were saved and I think the results were probably better than they would have been if taken up before the Judge, and Surveyors only called in as witnesses. The fact that the Act provides that the Referee's charge shall not be less than $10 or more than $20 a day is also rather in favor of the ordinary practitioner.

On the question of the per diem charge, I have made some enquiries and I find that in cases of arbitrations and references to judges and legal practitioners, it is customary to have a consent given, signed by the solicitors for both parties, something to this effect, "It is consented by counsel for both parties that the total number of hours occupied by the Referee in hearing evidence or argument and in considering his award or otherwise in connection with this reference shall be added together and such total number shall be divided by six, and that each six hours of the said total number shall be taxable as a statutory day. Fractional parts of days shall be taxable at the same rate. Adjournments are to be taxable as provided by the Statute.

This prevents any possible chance of an appeal to taxation on the question of the Referee's right to make the per diem charge of $20 per day as provided by the Act.

President Ross:—In what year was the Act passed ?

Mr. Van Nostrand:—It is in the Revised Statutes of Ontario, 1897; and it is published in our Manual at page 37. It is very interesting reading.

Mr. Walker:—Did I understand Mr. Van Nostrand to say that he did not take any measurement on the ground; that he was the Judge altogether.

Mr. Van Nostrand:—I took the evidence on the ground. And I had learned that the former survey had been made many years ago by Mr. Passmore; and knowing that his Field Notes had not been filed, that it was simply a survey ratified by Act of Parliament whereby only the work on the ground and the plan as recorded in the Crown Land's Department were official, it was necessary to have the consent of the parties to consult his Field Notes. These Field Notes I found, after a great deal of trouble, and they practically settled the point. They were very definite as to what was done in that particular case, and they showed clearly how their survey should be made. Without those Field Notes the results might have been very different; but the Field Notes were very satisfactory. Knowing that Field Notes are not considered official, nor considered evidence unless the Surveyor is there to swear to them, I overcame the difficulty by getting the written consent of each of the solicitors acting for the three parties and that estopped them when they came to the Judge. Copies of the Field Notes relating to the question were filed, that was included in their "Consent." Exhibits were put in, I think about a dozen or more; they all had to be put in; and everything was done in the usual court form. This, however, was quite a different style of reference from those referred to by Mr. Kirkpatrick and Mr. McDowall who were called in really to assist the Judge after he had the witnesses before him. In the case I had, the parties agree on a joint Surveyor or Referee and the Judge simply found on the Referee's finding.

Mr. Walker:—The point I wanted to get at was, did you make any surveys at all?

Mr. Van Nostrand:—The surveys were made after the Notes had been consulted, but that was a comparatively unimportant matter; it was simply ranging a line between two points on either side of the concession.

Mr. Walker:—The evidence you took was more to decide on the governing points.

Mr. Van Nostrand:—The evidence was to fix the governing points, and to decide as to whether there was originally a jog at the blind line. The survey was a small matter and (including the planting of six monuments) was done in one $15 day.

President Ross:—You get the Referee's fee for your survey as well as for acting as Judge.

Mr. Van Nostrand:—Yes, throughout.

Mr. McDowall:—I might say that, in my case, I was advised by Mr. Thom to always make my bargain before I started on my reference.

TRACK SURVEYING.

Mr. Stewart:—I can give an account of a little track surveying, (if by that term is understood an approximate survey of a route), that I undertook a few years ago. I was going to spend my vacation in the Rocky Mountains; and we intended to start from a point of the C.P.R. just in the eastern outskirts of the Rockies, and, following the trend of the mountains, keep among them or in their outskirts, nearly up to the source of the Athabasca River. It struck me, before leaving, that it would be rather interesting, as most of the country was almost unknown, if I could bring home some results that would enable me to make a map of our route. I looked through all the different works on surveying that came within my reach but I could find no information as to how such surveys were generally carried out; so I decided to make a traverse of the route, using a prismatic compass to give the direction and a pedometer to give the distance. I knew of course that the pedometer worn in the pocket and carried as one walked along, going up and down the hills and over swamps and wading streams and so on, would give an indication of distance that would very far exceed the straight line distance between any two points; so I assumed that the distance given by the pedometer between two points bore a constant ratio to the straight line distance; and on that assumption I made my survey. Then, wherever possible, once or twice a week, I observed for latitude; I had with me a good marine sextant, reading to ten seconds, and an artificial horizon. I observed also for time, although the watch I had with me was not a very reliable one, but I wanted to compare the determination of longitude given by the watch with the determination by dead reckoning afterwards. On my return I set to work to make a map from my notes and observations. I fixed the geographical position of the starting point from one of the Geological Survey maps—it was a point near the C.P.R., which was pretty well determined, so I had no difficulty in fixing its position geographically, fairly closely. I then drew on a scale of five miles to the inch, the meridians and parallels of latitude within the region which we had explored. Then, with reference to these meridians and parallels I located the position of the starting point. From thence I plotted my traverse, correcting my compass readings for variation; and reducing my pedometer distance from point to

point by about a third, so as to approximate to the straight line distance between points at which bearings were taken. I plotted the traverse then from the starting point to where my first latitude observation was taken. I found the position of this point with reference to the nearest parallel to be a little too far north, on comparing it with the observation for latitude. Then assuming that the pedometer distance between two points bore a constant ratio to the straight line distance, the direction of a line joining the terminal points of an extended traverse would be correct; so I joined the point determined by dead reckoning at where the first latitude observation was taken with the starting point, and then at the point in which that line intersected the parallel drawn through the latitude observed. I located the point; and then I squeezed the whole traverse in and made it fit between those two points. The plotting of the traverse line on the map was carried on in the same way to where the next latitude observation was taken, and that point was located, in the same way, as just described. In this way I plotted the whole route.

I afterwards plotted the topography, sketched in the mountain ranges and streams, and so on, with reference to the traverse line. I have reason to believe the work was fairly correct. Our route lay in a north-westerly direction, so that it was the best direction for surveying in that way. I was able to compare the position of a certain sketch of the Athabaska River; determined from my survey, with its position as determined by Captain Pulliser about thirty years previously. He explored from another direction; he went from Edmonton, and crossed the Athabaska, working up to the Jasper House, and carrying on his explorations from there to near where we left off. He spent several months, I believe, at the Jasper House, and made a number of determinations by lunar distances of the longitude of that place. From the Jasper House, in going up-stream along the Athabaska, you are going nearly south, so that the longitude of the point where we ended our explorations is about the same as that of the Jasper House; and comparing the position of this stretch of the Athabaska River with its position as given by Pulliser, they agree within a fraction of a mile; and as my determination was made altogether by dead reckoning, merely correcting a traverse line by latitude observations, it is a very good check on the accuracy of the whole survey. I think this is the best method to follow in making a track survey. The great difficulty of course in mak-

ing such a survey is to get a reliable determination of distance; but if some method is used that will give a determination of distance that will bear something like a constant ratio to the true distance I think you can, by correcting your work by frequent latitude observations, make a survey of a considerable portion of country from which a good map can be constructed. The map that I made from about two months' work covered a piece of country about 300 miles long by 50 or 75 wide; the survey was made single-handed and I think was fairly accurate.

Mr. Tyrrell:—What method did you adopt in determining the variation ?

Mr. Stewart:—The method I frequently adopted was, after observing for time, to take a number of compass bearings of the limb of the sun, noting the time, and then afterwards comparing the true bearing of the sun's limb from its declination at the time, its hour angle, and the known latitude. Having found the true bearing in that way, a comparison of the compass-bearing gave the variation.

Mr. McDowall:—Suppose the country in one place was very level would it bear the same reduction of distance ?

Mr. Stewart:—It would not, strictly speaking; but in the long run errors would tend to compensate one another.

Mr. H. H. Gibson:—How closely can you determine latitude with a sextant ?

Mr. Stewart:—Comparing my different latitude determinations, I think with a marine sextant like mine, with an artificial horizon, you can get latitude within ten seconds, by making a number of determinations by circum-meridian altitudes, and taking the mean, assuming there is no eccentric error in your sextant. There might be a large eccentric error which should be determined.

President Ross:—You said you did the work single-handed. I suppose you had assistance to carry your outfit. I presume you speak of the instrumental work when you say that.

Mr. Stewart:—Yes. Our party consisted of three besides myself, and then we had a couple of Indian guides and packers. I meant as far as the instrumental part of the work was concerned.

PAPERS.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

LOCAL DEFLECTION OF THE PLUMB LINE.

BY OTTO J. KLOTZ.

In the present short paper it is only intended to lay before the Society certain data of the deflection of the plumb line as found by latitude observations and azimuth surveys along the International Boundary, 49th parallel, from the Lake of the Woods to the Pacific Ocean. Those westward, as far as the Rocky Mountains, were published years ago in the United States Report of the Northern Boundary Survey, but those of British Columbia have, to my knowledge, never been published. The effect of deflection of the plumb line on longitude and azimuth observations is not considered in the present paper.

Deflection of the plumb line may be defined as the deviation of the vertical at any point from the normal at that point to the surface of an assumed figure of the earth. In dealing with the earth, we must assume its shape to be of some definite geometrical form and of certain dimensions, for only then can observations, at different points thereon, be correlated and adjusted. The best assumed form (Clarke's 1880 spheroid at present), however, differs at places widely from the actual form or geoid. To illustrate, if the continents were traversed by narrow canals, communicating with the ocean, their surface, although level, would be wavy or undulating, and would be in some places above, in other places below the surface of the spheroid or ellipsoid of revolution, the divergence of the two surfaces being probably confined to a few hundred feet.

The position assumed by the plumb line, is due to the law of gravitation, that is, it is the integrated result of the attraction of the individual particles, composing the mass of the earth, and hence the position is affected by the relative distribution of them. We may, therefore, say that the unsymmetrical distribution of the particles, whether on the surface, as mountains, etc., or in

the thin crust, is the cause of the deflection of the plumb line from its theoretical position. The ablest mathematicians have been engaged, ever since the era of precise measurement, upon this difficult question of the form and dimensions of the sea level surface.

In some instances we are quite prepared to find local deflections of the plumb line, for example, when observations are taken on the plains at a point near a more or less isolated upheaval, as the Three Buttes or Sweet Grass Hills in Montana, just south of the International Boundary. These hills, as we shall see later, pulled the 49th parallel out of its theoretical position about 800 feet. On the other hand, large deflections show themselves without any visible reason or cause as evolves from numerous observations and their geodetic connection. A remarkable instance is that of the comparatively plain area surrounding Moscow, which I visited recently, where, on the margins of an eighteen mile east and west zone, large deflections of opposite signs were found. From this it must be concluded that there exists beneath the surface a cavity or at least matter of small density.

It is evident, therefore, that the observations alone, at any particular point, are not conclusive for fixing its geographical position upon the surface of the earth, but that numerous astronomically determined points must be connected linearly by triangulation, and from their inter-accordance, or discordance, the most probable values determined, based upon an assumed figure of the earth.

In our own city here (Ottawa), there appears, due to the topographical configuration, to be a deflection of the plumb line; for, the latitude determinations made by me at the observatory on the summit of the escarpment, compared with those made some years ago by Mr. Lindsay Russell on the opposite side of the river, show a discrepancy of about a second of arc, equal to about a hundred feet, a quantity greater than the error of observation. However, a more or less extended hypsometric survey would be necessary for a plausible *a priori* conclusion with reference to the probable discordance in latitude to be expected between two stations.

All observations for the determinations of positions upon the earth depend upon the direction of the vertical. Latitude and longitude observations, the surveyors' and engineers' operations, all have their zero of reckoning in the centre of the level bubble,

and any displacement of the latter, which is equivalent to the displacement of the plumb line, affects the results, and will show discordances when widely separated observations are geodetically connected.

It may be stated that a delicate level used for latitude work, reading to a second of arc, has usually a radius of about 1,700 feet, or nearly a third of a mile, for the curve ground on its inner upper surface.

To digress for a moment.

Boundary lines may be divided into three classes: those representing a social unity, those representing a physical unity, and those representing a political unity. Those of the first find the largest number of representatives in the older settled countries, for the primal concept of boundary was to conserve the social unity. It was not to define territorial extent as much as to define or assert the domain of a like people; like by language, race, or religion or other affiliation. Such boundaries are, as a rule, very irregular and difficult to describe. When the social organism reached that development that written treaties became necessary between adjoining peoples, the description of the separating boundary was made from the boundary *de facto*, and the boundary not laid down from the description.

The second class we may consider an expansion of the first, resulting from conquest, whereby a physical as well as a social unity was to be preserved. Of the physical boundaries—mountains, rivers and lakes—to serve the purpose of barriers, by mountains, that end is undoubtedly best attained. Europe furnishes a number of examples of this.

The third class, which we may call the astronomic boundary, is a development of recent times, and applies invariably to areas practically unsettled, unsurveyed and little known. Such can be laid down on paper, or described in treaties without scarcely any knowledge of the country whatsoever.

While Europe furnishes the most examples of the first, America does so of the last. Many of the State boundaries of the United States are astronomic lines, either meridians, parallels, or lines of definite azimuth. Similarly with the subdivision of Australia and recent boundaries in Africa. Astronomic boundaries may generally be taken as an index of the ignorance existing of the country or area involved and its resources.

Boundaries under the first division are difficult for definition or restoration when such is necessary. Those of the second,

always dependent upon water, are generally self-evident, while those of the third are comparatively easy of determination.

There are instances of a fourth class of boundaries—where the position of it is dependent upon the position of a physical feature—e.g., that it be at or within a given distance from a river or the sea.

A notable case of the last is that of south-eastern Alaska, as described in Article 4 of the Convention of February 28, 1825. Such boundaries are exceedingly difficult to lay down on the ground, requiring, too beforehand laborious mathematical calculations. The Railway Belt of British Columbia, extending twenty miles on each side of the Canadian Pacific Railway, gave the writer an example of such computation.

A river, and least of all a large river, a commercial artery, forms an undesirable international boundary. The very nature thereof makes it a route of travel, and hence of settlement on its banks, which, if in possession of two countries, is almost sure to lead to trouble. Hence we find few or no large rivers forming such boundaries, although our own St. Lawrence does for a short distance separate us from our southern neighbor. A summit or watershed boundary is pretty satisfactory, if restricted to mountains, but when applied to plains or undulating country, is fraught with difficulties. The difficulty consists in establishing the line of watershed, as was presented in the Maine-New Brunswick controversy early in the century.

Of the several classes of boundaries spoken of, none is as immutable as the astronomic one. Of the first, the original monuments and records may disappear, and personal evidence be wanting. Of the second or physical boundary, time may bring about changes quite as marked and cause the line to move therewith. As a well-known instance, the Mississippi may be cited. In a recent report of the "Idaho and Montana Boundary Line" we have another illustration. It is stated that "from a geological standpoint, but hardly from a practical one, however, there is another reason why monuments should not be placed on the summit of the Bitter Root range, as marking the boundary line between Idaho and Montana. There is abundant evidence that the summit is what is known as a retreating or migrating divide; in other words, the waters tributary to the Bitter Root River in Montana are continually capturing by erosion those of the Clearwater River in Idaho, so that the divide is slowly being shifted to the westward, thus adding to the territory of Montana

and diminishing that of Idaho. The existing divide is uniformly from six to eight miles from the irregular line representing the original divide, if the latter may be accepted as having passed through the highest points of the range, which seems probable."

When a boundary is defined by a parallel of latitude, the question invariably arises, in the demarcation of it, whether the astronomic or mean parallel is to be adopted. The astronomic parallel is that line on the surface of the earth on which direct observations for latitude give the same elevation of the pole; geometrically, for the spheroid or ellipsoid of revolution, it is the intersection of the cone, having its apex in the minor axis of the earth and making an angle therewith equal to the complement of the latitude, with the surface of the earth. Principally owing to the local deflection of the plumb line, points astronomically determined in latitude will not "close," that is, the line projected or run from one station as a parallel will not meet the next point or astronomic station.

That line with reference to which the sum of the discrepancies north is equal to the sum of those south is the mean parallel.

However, as the latter can only be determined *after* the location and connection of the astronomic points, entailing revision of the whole work, and besides the difficulty of re-establishing points on the mean parallel in case of loss or disappearance of monuments and marks, it has generally been decided to adhere to the simpler and more readily established astronomic parallel. All such parallels traced upon the earth are irregular curves.

The International Boundary Line, between the Lake of the Woods and the Rocky (Stony) Mountains is defined in the second article of the Convention of 1818 as being the parallel of 49 degrees north latitude. The immediate cause of the delimination of the boundary was the discovery that the fort of the Hudson's Bay Company at Pembina was nearly a mile within United States territory.

The field work was begun in September, 1872, and finished in the same month two years later, while the proceedings of the joint commission were brought to a conclusion May 29, 1876.

On this line of 860 miles, 40 astronomic stations were established, and 388 monuments erected.

After due consideration, the commissioners agreed upon the astronomic parallel. The recommendation for this, by the chief

astronomers of the commission, was based on the following grounds: "1st That the portion of the parallel of 49° included within the operations of the commission, being only about one-twentieth of the entire circle of latitude, was not sufficient to fix, with any mathematical accuracy, the true position of the mean line of 49°, and that, therefore, if such a parallel were described, depending on the mean of the astronomic stations, no known point of the boundary would be in latitude 49°; 2nd That as the amplitude of the arcs, included between the mean and the astronomical parallels, would in many cases be very considerable, grave errors and complications might arise in the subsequent re-survey of any lost portion of the boundary; 3rd That the definition of a mean line would involve a re-adjustment of the whole boundary, after the first careful survey should have been completed, and consequently a very considerable increase of expense without any practical benefit accruing; 4th That for every purpose except that of geodetic computation, a parallel of points determined astronomically (instrumental errors aside), is a true parallel of latitude, and therefore, fulfils the stipulations of the treaty under which the joint commission was organized."

Accordingly, astronomic positions were determined at approximate intervals of twenty miles. These stations were connected by tracing upon the ground tangents to the prime vertical circles at each successive point. From these tangents, checked and corrected for errors of azimuth, the calculated offsets to the small circle of latitude were measured at convenient intervals, varying from one to three miles. From the last mentioned offset the relative station error (deflection of plumb line) was found and distributed between the two stations in the ratio of the distances where offsets were taken. From this method it results that the boundary line, as actually traced, is an irregular curve, affected at each astronomical point by instrumental errors and by the local deflection of the plumb line, making the closest probable approximation, at every point, to a true astronomical parallel.

Of the forty astronomical stations on the 49th parallel, four were observed jointly, seventeen by the United States astronomer and nineteen by the British. The mean of the probable errors of the British stations was ±″.088 and of the United States ±″.059. The average of the probable errors is then a little over seven feet.

The greatest difference of station errors is 13.″89 or 1,407 feet, being in a distance of 97 7-10 miles, between the Cypress

Hills to the north of the boundary, and the Three Buttes or Sweet Grass Hills near, and to the south of the 49th parallel. The station error of the former is + 5."94, of the latter — 7."95, that is, the Three Buttes pulled the 49th parallel 805 feet south, and the Cypress Hills 602 feet north of the mean parallel. The greatest discrepancy between adjacent stations, about twenty miles apart, is 7."28 or 738 feet, near the Three Buttes. From Lake of the Woods, westward, into the valley of the Red River, the station errors increase, and for a reason, which from our lack of knowledge of the underlying strata, must be conjectural. The escarpment of the Pembina Mountains (elevation would be a more appropriate term, height 1,695 feet), naturally draws the vertical southward, continuing to do so until the Turtle Mountains (of moderate elevation, 2,550 feet) are reached, which, too, deflect to the south. After entering the Coteau of the Missouri we pass along the southern base of the high ridge separating the waters flowing into the Gulf of Mexico, from those flowing into Hudson's Bay, and find, naturally, a deflection to the north, increasing to a maximum, south of the Cypress Hills (3,800 feet). Here the enormous intrusive masses of the Three Buttes, produce a violent disturbing effect, drawing the astronomical parallel to the south, at an average rate of 14 feet to a mile, for a distance of about one hundred miles. When we actually enter the tumultuous Rocky Mountains, with all their varied conditions of compositions, of faults and dykes, and our lack of hypsometric maps, we are unable to even make a plausible estimate in which direction the local deflection is to be expected. Even the relative deflection between adjacent stations remains unknown in most cases on account of the great difficulty in connecting them geodetically.

As a very remarkable example of the deflection of the plumb line may be mentioned, the one on the arc of the meridian between Andrate and Mondivi, in northern Italy, where in a distance of a little over seventy-seven miles, a difference of nearly forty-one seconds was found, that is to say, the difference in the distance between these two terminal points determined by direct astronomic observation, and also linearly by triangulation was found to be about 4-10 of a mile. How much of this quantity is attributable to each place for local deflection, and again, how much is due to relief or topography, and how much to the unequal distribution of masses beneath the surface of the earth, is not known.

It is evident that observations at two places which are also geodetically connected, can only give the relative deflection of the plumb line.

For the boundary between the Lake of the Woods to the summit of the Rocky Mountains, the Commissioners agreed that the line joining any two adjacent monuments shall be an arc of the parallel. This was to apply, too, in the case of restoring any monument whose position was lost. This agreement differs from that of the boundary commissioners, who had charge, some seventeen years previously, of defining the boundary from the Gulf of Georgia to the summit of the Rocky Mountains. They agreed that the connecting line between monuments shall be a straight or direct line, i.e., an arc of a great circle.

The international boundary commission appointed to define the boundary under the first article of the Treaty of June 15, 1846 (the present southern boundary of British Columbia), was organized in 1858 (first meeting August 13th), and in the summer of the same year began field work at the western terminus of the boundary. The observations and surveys were carried eastward under great difficulties, owing to the heavy forest and mountainous character of much of the country. Early in 1862 the field work was completed and the preparation of the maps begun, which were, however, not completed and jointly signed by the commissioners till 7th May, 1869. A report was never published.

Between the extreme east and west points, upon the watershed of the Rocky Mountains, and the eastern shore of the channel which separates the continent of North America from Vancouver Island in west longitude 114° 03′ 34″ and 123° 3′ 53″ respectively, the exact length of the boundary line upon the 49th parallel of north latitude is 409 4-10 miles. The position of the parallel was determined by 28 astronomical stations, 11 of which were established by the British Commission, 14 by the American Commission, and 3 were observed by both. Another station was fixed by the British Commission at Schweltza Lake,but it was at the time rejected on account of the apparently large deflection of the plumb line, though the after experience of the most accurate instrumental observations in that mountainous country, led to the conclusion that the result at Schweltza was quite as trustworthy as any of the others. It is, however, not included in the final determinations.

At the first meeting of the Commissioners at Semiahmoo, August 13, 1858, it was concluded, after discussing plans for determining and marking the line as far as the Cascade Mountains, to be inexpedient at that time, in consequence of the great expense, consumption of time, and the impracticable nature of the country, to mark the whole boundary by cutting a track through the dense forest. It was therefore agreed to ascertain points on the line by the determination of astronomical points at convenient intervals on or near the boundary; and to mark such astronomical stations or points fixed on the parallel forming the boundary, by cutting a track of not less than 20 feet in width on each side for a distance of half a mile or more, according to circumstance. Further, that the boundary be determined and similarly marked where it crosses streams of any size, permanent trails, or any striking natural features of the country. In the vicinity of settlements, the line to be cut a greater distance. Bessel's value of the figure of the earth was adopted.

From the two points on the parallel, dependent respectively, on the Sumass and Schweltza astronomical stations, cuttings were made to connect the points. When the cuttings met, there was found to be a discrepancy of 8″, say about 810 feet; they were, however, connected, though the line thus defined is obviously not strictly *the* boundary of the treaty. The distance is about 9¼ miles. This relative deflection of the plumb line, 8″, in so short a distance, is the largest on the whole 49th parallel, from the Lake of the Woods to the Pacific. When the cuttings on the parallel from Sumass and the British station at Semiahmoo met, there was a discrepancy of 114 feet in the 20 miles, and between the United States astronomical station at the east shore of Semiahmoo Bay, and the British one five miles east thereof, a discrepancy on the parallel of nearly nine feet was found, an error quite within the error of observation.

The only other cutting on the whole boundary line west of the Rocky Mountains, connecting adjacent astronomic stations is between the Similkameen and the Columbia rivers, a distance of 96 miles. The stations there in order eastward are: Similkameen (U.S.); Lake Osoyoos (Br.); 1st Crossing Newhoilapitkw (U.S.); 2nd Crossing Inshwointum (Br.); 3rd Crossing Statapoosten (U.S.); and on the Columbia (Br. and U.S.). From the point on the parallel at Lake Osoyoos, a line was run east and west 30⅕ miles, connecting with similar points at Similkameen and at the 1st Crossing. The line was found to

strike 509 feet north of the former point and north of the latter 364 feet, showing a marked deflection of the plumb line. When, similarly, an east and west line was run from a point on the parallel at Inshwointum, it was found to be south 300 feet of the point on the parallel at the 1st crossing, and 180 feet north of the point at Statapoosten.

This shows, therefore, a discrepancy between the latitude of Lake Osoyoos (Br.) and Statapoosten (U.S.) of 844 feet, due to local attraction or difference of local attraction. After verifying the accuracy of the latitude observations, it was decided to adopt the mean parallel, based on the differences found, between Similkameen and Statapoosten—a distance of 71 miles. This is the only part of the whole boundary line between the Lake of the Woods and the gulf of Georgia, where a mean parallel has been adopted for the boundary, instead of the astronomic parallel. These seventy-one miles were re-cut on the mean parallel. From the extremity of the mean parallel at Statapoosten, an east line was run to the Columbia, where a difference of 212 feet was found between the mean of the British and United States latitude determinations there and the mean parallel. The line (for final boundary) was thereupon deflected from Statapoosten so as to strike the above mean Columbia position of the 49th parallel.

The actual definition of the boundary is as follows: Its western extremity is marked by a substantial granite obelisk in longitude 123° 03′ 53″, west, standing upon a steep cliff on the western face of the promontory of Point Roberts, about 160 feet above the sea. For 44.8 miles eastward there are 42 iron pillars placed at suitable points on the boundary. One pillar stands on the eastern face of Point Roberts, 2 miles 704 yards from the obelisk, and there are two intermediate pillars in the interval at average distances apart of somewhat more than ¾ mile. A pillar on the west shore of Semiahmoo Bay is 12 miles 1,777 yards from that on Point Roberts on the opposite side of the bay; and thence is 29¾ miles to the easternmost pillar, the average distance apart is about 1,380 yards, varying between 1 mile 1,245 yards and 198 yards on the opposite bank of the Sumass River. These pillars all stand in a continuous cutting through the forest or in intervening patches of swamp and prairie. From the easternmost iron pillar, to the right or west bank of the Similkameen river is 107.9 miles, the boundary is defined in the vicinity of 9 astronomical stations by 19 cairns

or pyramids built of dry stones, and one bench mark cut on the face of a rock at Ensakwatch; and at several stations short vistas were also cut in the forest, between the cairns. This wide interval comprises the rugged and inhospitable region of the Cascade Mountains. One of the widest unmarked intervals on the boundary occurs in these mountains, between Pasayten and Naisnulch, the distance between the marked points being 23.7 miles. From a cairn at the foot of the mountains on the west side of the Similkameen river to the east or left bank of the Columbia, the boundary for 95 miles is well and continuously marked by 69 stone cairns and one mound of earth, and by forest cutting in all necessary cases. This was the most favorable portion of the work, part of the line passing over rolling prairie country interspersed with wood; but very considerable portions were also mountainous, rugged and heavily timbered, though more accessible from the valley of the Newhoialpitkw (Kettle) river than were the Cascade Mountains. Two cairns stand within 129 yards of each other on the east bank of the Columbia (one having been placed by each Commission) and the average distance apart of the remainder is 1 mile 679 yards. From the hill tops the line of boundary defined by cairns and cuttings can be traced for many miles. For the remaining 161.8 miles between the eastern cairn on the left bank of the Columbia river and the terminal point on the watershed of the Rocky Mountains in west longitude 114° 03′ 28″, the boundary passes over successive mountain ranges intersected only by the valley of the Kootenay River at two points 75¾ miles apart and by the adjacent valleys of the Flathead river and its tributary Kishenehu creek. This portion of the line is marked in the vicinity of 9 astronomical stations, by 26 cairns and one bench mark cut in the face of the rock at the Kootenay Mountain Station, and by a cairn fixed by survey on the trail between Kootenay west and Mooyie station; and the usual forest vistas cut at the usual defined points, besides longer cuttings of seven and ten miles at the eastern crossing of the Kootenay, and between the Flathead and Kishenehu rivers. On the summit of the Rocky Mountains the monument consists of a pyramid of dry stones, situate on a narrow saddle with precipitous sides connecting two lofty mountains, serving to identify the locality between the Columbia and the Rocky Mountains, exclusive of the Mooyie trail cairn, and the intervals between the Kootenay mountain and Kootenay west stations, and Mooyie and Yahk stations, the distance between the conse-

cutively marked points at the several astronomical stations averages about 13¼ miles; but between the stations named they extend to 25 and 24 miles owing to the inaccessible nature of the intervening country, which is quite as bad as the Cascade Mountains.

As already stated, the Boundary Commissioners had agreed to understand the boundary laid out by them, to consist of a series of straight lines between the successively marked points, without regard to the distances between those points or the curve of the parallel in the longer intervals. That they did upon the consideration that it was of the greatest importance that nothing should be left for future discussion of settlement, and that the operations should be final and conclusive. It may be stated that opposite the centre of a chord of 25 miles in length, the departure from the 49th parallel would be about 40 yards, and of 12 miles, 9 yards. Both these departures are probably far smaller than the deflection of the plumb line, at the governing astronomical stations.

We have, therefore, in the actual boundary line of British Columbia, a deviation from the 49th parallel, as given in the treaty of 15th June, 1846, in so far, that the straight lines replace the curve of the parallel between all the stations, and furthermore, that between Similkameen and Statapoosten, the mean parallel was adopted instead of the astronomically determed points.

We have followed now the 49th parallel for 1,270 miles, about one-thirteenth of its circumference, and it has disclosed to us some of its vagaries as manifested in the latitude component of the deflection of the plumb line. This boundary line is the longest astronomic one on the earth, the nearest approach to it being the meridian separating West Australia from North and South Australia.

The same law or force which causes the deflection of the plumb line, determines the length of the seconds pendulum, preserves the planets in their orbits, and maintains the stability of the universe—is the law of gravitation. Our earth furnishes us with many interesting problems, and the very discordances observed—apparent though they are—tend to lead us on to unravelling the mysteries and intricacies of nature, and to unfolding the unity and harmony of the cosmos.

DISCUSSION.

Mr. Aylesworth:—Not very long ago some newspapers stated that the boundary between Canada and the United States had to be re-run. Is there any question of that ?

Mr. Sankey:—I think if there is anything to be done it will be simply to replace some of the monuments.

Mr. Aylesworth:—Some that have been lost or effaced.

Mr. Whitson:—I think the question arose as to the boundary line between Lake Superior and the West Shore of Lake of the Woods (of which there was not a very accurate survey made), taking in Hunter's Island.

Mr. Sankey:—Doesn't that boundary come under the second clause ? Isn't that a physical boundary ?

Mr. Whitson:—Yes.

Mr. Aylesworth:—I do not see any object in retracing a physical boundary except in order to lay it down accurately on paper.

The President:—I think Mr. Kirkpatrick gave us an explanation with regard to the Hunter's Island dispute a year or two ago, when it was discussed in the papers. But it would be better just now probably to stick to the points brought up in Mr. Klotz's paper and if any one has any remarks to make or any motion to bring forward we will be glad to have it.

POLAR EXPEDITION.

BY CAPTAIN J. E. BERNIER.

As a Canadian I feel greatly honored in having this opportunity of explaining in the Queen City of Canada my plans for exploring the unknown portions of the Arctic Basin, and reaching the highest latitude possible, sailing through the Strait of Behring, and I hope with the help of God to reach the Geographical Pole.

The desire to draw aside the veil of Arctic and Antarctic is certainly upon us.

Of what use will it be ?

To such a question my reply is:

That both Arctic and Antarctic are of great importance for scientific purposes and commercial in general, if it be merely to contend in what has become an international competition; no country is so ready to appreciate, and reward the explorers of other nations or to show so much sincere generosity as our own; and it will be an evil day for Great Britain and Canada when they cease to take part in what has become a competition between all the foremost nations, and are content to yield their portion in the race for Arctic and Antarctic discovery. Our place has been too long in the front rank for us to back out and allow other flags than the Union Jack to wave in the most prominent position.

With the index pointing towards the Poles, our word should be " Forward " and by our action in following that direction we should show the world at large that we are worthy of being called sons of the foremost nation.

The results of scientific importance to be derived from an examination of the immense unknown area round the North and South Poles are as numerous as the region to be explored is extensive. It may be shown that no such extent of unknown area, in any part of the world, ever failed to yield results of practical, as well as purely scientific value; it is impossible that its examination can fail to add largely to the sum of human knowledge; further it is necessary to bear in mind that the Polar Area is, in many most important respects, of an altogether special character, affording exclusive opportunities for observing the condition of the earth's surface, and the physical phenomena there to be seen, under certain singular circumstances, which are

due to the relation of this area to the position of the axis of revolution of the territorial spheroid, and which have to be considered not only with reference to the present time, but to the earth's past history. It may be, therefore, received as certain that discoveries will be made in all branches of science, the exact nature of which cannot be anticipated.

GEOGRAPHY.

A geographical problem of great importance and interest will be solved by completing the circuit from the Straits of Behring via the Pole to Greenland and Spitzbergen towards the Atlantic.

HYDROGRAPHY.

The necessity of investigating the depth of the Polar Basin current and out-put of the surface water, and the amount of ice and sea tempera'ure at various depths.

GEODESY.

A series of pendulum observations at the highest possible latitude as well as the direction of the force of gravity, and such observations would be especially valuable at 90 degrees north.

METEOROLOGY.

Observations of the temperature and pressure of the atmosphere and of the prevailing winds with reference to currents in very high latitude will form valuable contributions to Meteorological Science.

The climates of Europe and Canada, in no small degree depend on the atmospheric conditions of the Polar Area, in which the development of extremely low temperature necessarily leads to corresponding disturbances, the effects of which are felt far into the temperate zone.

MAGNETISM AND PHYSICS.

The extension of research into the Phenomena of Magnetism and atmospheric electricity in the vicinity of the Pole, where so many of the forces of Nature operate in an extreme degree, either of excess or defect.

THE STUDY OF AURORA BOREALIS.

The Study of Aurora Borealis which is amongst the most striking phenomena visible on our planet, and is almost impossible in low latitudes.

GEOLOGY.

A more complete investigation of the Geology of the Arctic regions is extremely desirable, both for its scientific importance and the value of its practical results. The geographical position of Island seen by Dr. Nansen and the crews of the "Jeannette" should be ascertained and some unknown islands may be found in shallow water near the new Siberian Islands. The distribution of small buoys along the course of the voyage from the Straits of Behring to where we will stop in the ice will record the time it takes to traverse the Polar Basin.

BOTANY.

The vegetations, wood and diatoms found in the Polar Basin will require to be studied.

ZOOLOGY.

The life of animals and different species of fish in the Polar Basin will also be observed.

ETHNOLOGY.

Ethnological observations with regard to unknown lands that may be discovered, the distribution of land and water in the Polar basins and many other scientific researches.

Let me explain my views of the Polar Basin.

First, we must divide the nearly stationary ice from the moving ice. We have to draw a line from Greenland to Point Barrow and as we know that Nature does not run any straight line, we have to put a curve to it, as we know that there is accumulation of ice, that has been seen so often by celebrated mariners.

In 1850-51 Captain Collinson's Ship "Enterprise" passed through the Strait of Behring in search of Sir John Franklin, the ship got into the heavy pack-ice, and the ice was extraordinarily thick and impassible, resembling rolling hills. This, with the experience of other explorers, seals the route towards the Pole passing near the Parry Islands. Another argument that I can bring forward is this:

What has become of the relics of all whalers that have been lost in the neighborhood of Point Barrow? They are in this heavy pack-ice, and are pressed upon the shores of the Parry

Islands, and probably never come out of the Polar Basin, being kept back by Grantland and Greenland.

The reports of Sir George Nares and Commander (now Admiral Markham), have proved the age of the ice and its thickness and motion.

SECONDLY, THE MOVABLE ICE.

This portion was well defined by the drift of the "Jeannette" and the "Fram," during the two years' voyage of the former vessel, and three years of the latter, but what we want now is to connect the two drifts into one. The drift ice to the east of the "Jeannette" track will naturally drift more slowly, and in my opinion would take longer time to get to the Atlantic Ocean.

THIRDLY:

The drift in the Polar Basin by the "Fram" and the "Jeannette" is now better defined, and it indicates that the "Jeannette" drifted on the western edge of the deep Ocean; we must conclude by the height and length of Greenland that the deep tongue of the Ocean in the Polar Basin is as long as the land of Greenland, for the depth of this Ocean corresponds with the height of Greenland, and the sooner a ship can get into deep water, the sooner she will get across the Polar Basin, towards the Atlantic.

FOURTHLY:

THE UNKNOWN ISLANDS.

We may expect to see new islands in the neighborhood of the new Siberian Islands, but no land where the water is deep. Wrangell Island and the new Siberian Islands are parallel with the range of mountains that runs in North America from Alaska towards the westward. Another point which indicates the movement of ice to the westward is open water in summer, west of the land, while to the eastward of land there is ice accumulation which obstructs navigation. To the west of the Alaska Coast, New Siberian Islands, Frank Joseph Land, Spitzbergen, Greenland, Ellemereland and Banksland, there is open water. The Polar Basin to-day is more navigable than it was 200 years ago. There is quite a change for the better in the temperature; open water has been more and more apparent.

FIFTHLY:

The wind problem will also favor a ship by the Behring

route. We must divide the Polar Basin into two parts. In the eastern part the prevailing winds blow towards the Behring Sea and Strait, while on the western part the wind blows towards the Atlantic. Thus an expedition starting from that route would be favored by the wind and the overflow of the Polar Basin, which is caused by the rivers of Siberia, and the thaws of ice and snow during some months in summer, and the rotation of the earth.

Regarding Diatoms found in Greenland and at the Strait of Behring, Dr. Nansen says:

"It is indeed quite remarkable that the Diatoms found off Behring Strait and on East Greenland should so completely resemble each other; it points to an open connection between the Sea east of Greenland and North of Asia. Through this open connection drift ice is therefore yearly transported across the unknown Polar Sea. On this same drift ice, and by the same route, we will put our expedition, and come on this side of the Atlantic."

But Dr. Nansen never went that way.

The Gulf Stream which enters the Polar Basin by the west side of Spitzbergen is warm salt water, and as soon as it meets the fresh water of the Polar Basin it dives under the fresh water and ice, and goes north until it has lost its vitality. What do you think of a basin filled from so many sources? The water must find its own level somewhere. Well I will tell you the Polar Basin Level is higher than the Pacific Ocean and the Atlantic Ocean; some of its cold water goes towards the Pacific Ocean, but the greatest part towards the Atlantic, finding its way between the Parry Islands, through Robeson Channel, and between Greenland and Spitzbergen, which brings us a quantity of polar ice and icebergs from different sources, and also a fine healthy air that we enjoy in summer, for the Polar Basin and its tributaries are the healthiest part of the world.

If you will permit me I will show you on the screen the state of the ice all round the Polar Basin and Greenland as seen by some of the most celebrated arctic explorers.

In April, 1827, the British Government appointed Capt. W. Edward Parry to carry out an expedition to the North Pole by way of Spitzbergen, it having been reported by whalers that there was a vast opening in the sea to the north-west of Spitzbergen in summer. Capt. W. E. Parry tried to reach the North

Pole by that route; putting his ships in shelter at the Seven Islands, he fitted out two boats 24 feet long, each weighing, with their stores, 3,058 lbs., and manned by 14 men. He proceeded to the north at a good speed, but finding the currents against him and making poor progress, although doing remarkable work, he decided to return after having reached 82.45 north. This is an example of working against nature.

On October 14th, 1871, Capt. Tyson and a party of 19 others were separated from the U.S.S., "Polaris" in about latitude 78. north. Unable to regain their ship the whole party remained on the floe and accomplished one of the most wonderful journeys on record. After a drift of some 1,500 miles in 195 days, they were finally rescued on April 30th, 1872, by the sealing steamer "Tigress" (Capt. Isaac Bartletts of St. Johns), in about latitude 53.35, north.

THE REMARKABLE TRAVELLING OF ICEBERGS.

Here, the lecturer pointing to the diagrams he was exhibiting, said,

This iceberg is about 400 feet high and is now leaving the glacier in Greenland.

This iceberg is about 450 feet high, we can see that by the height of the vessel's masts.

This iceberg near Disco is on his way south, and we can see the field ice at his foot.

This little iceberg is on the Bank of Newfoundland and as the waters of the Gulf Stream are melting it, it will soon disappear out of sight.

In 1875 and 1876, Sir Geo. Nares, Commander of the English Expedition through Smith's Sound and Robeson Channel.

Sailed on the 12th May, 1876. Here we see,

Chart of Davis Strait, and route from England.

Ship "Discovery" leading through the ice in Robeson's Channel.

Ship "Discovery" left at winter quarters in Franklin Bay.

Capt. Stephen of "Discovery" Lieut. (now Admiral) Markham and Dr. Moss.

Ship "Alert" nipped off Cape Beachy by an ice jam.

Ship "Alert" off Cape Union, and during the spring, 1876.

Ship "Alert" in winter quarters.

Push for the Pole with sleighs with the party of 17 men commanded by our friend, Admiral Markham.

The Sea of "Ancient Ice."

Admiral Markham and a few of his men planting the flag in 83.20, north.

Map showing the high point reached by Admiral Markham, and the new coast line discovered.

This constituted one of the best equipped expeditions that was ever planned to reach the North Pole; but it was fighting against nature and when Sir George Nares said to Admiral Markham—"How old is the ice?" he replied—"Well, it may be 50, and it may be 500 years old."

This indicates that it is very ancient and constitutes part of the nearly stationary ice, and the fact of constant pressure upon the Greenland Coast was established for ever.

Here we see,

Lieut. Peary, and Mrs. Peary who followed her husband as far as Franklin Bay.

In 1892, Lieut. Peary's plans for reaching the North Pole by Greenland.

Sledge used by Lieut. Peary while he travelled across Greenland. I see that he utilized Nature as well as other forces, and he says that the coldest place in the Polar Basin is on Greenland at the elevation of 8,000 to 9,000 feet.

Lieut. Peary's new plan for reaching the North Pole. I must give Lieut. Peary the compliment he deserves; he is persevering, courageous, and made of the right stuff for an arctic explorer; but I am sorry he took the wrong way to the North Pole, for he has no help whatever from Nature, and the Esquimaux will never be induced to follow him where there is no animal life,—these children of nature will not venture where they cannot get their living.

This picture shows the state of ice in Mr. Walter Wellman's march to the North Pole off Franz Joseph Land on leaving in 1898.

The Duke of Abruzzi's voyage, reaching 86.33, with sledges and boat, shows that the ice is traversable in certain times during part of the year, also the open water on the west side of Franz Joseph Land, which was also proved by our friend, Mr. Frederick Jackson and Harmsworth's expedition.

While we are in the Arctic regions, let us look a little at this.

Map with regard to wind-drifts and currents.

Antarctic.

I will give you my experience in this part of the world as regards wind and currents. From Cape Horn to Cape of Good Hope, the wind and current prevails from the west, from the Cape of Good Hope and around the southern coast of Australia, the wind and tide prevails from the west, and from the southern coast of Australia to Cape Horn, again the wind and tide prevails again from the west, therefore the wind and tide goes round the outside circle of the Antarctic, so that we in our voyages to these different parts take good care to use favorable wind and current, and we always run our eastern down as far south as possible, so all sailors believe in being helped by nature; one frozen in the pack of ice will drift to the east.

Let me illustrate to you the work of nature outside of the Polar Basin by wind-drift.

This chart shows the wandering of the derelict schooner "Fannie Wolston" in the North Atlantic, from October 15th, 1891, to October 21st, 1894, after having drifted from the prevailing west wind to nearly the Azores, then to the south she came back to the west with the Trade Winds, then to the north of Hatteras, having been sighted five different times by different ships and reported; this constitutes part of the work of Nature which I advocate.

The voyage of the "Jeanette" constitutes my first chain of evidence of the work of Nature in the Polar Basin.

Since 1878 I have been deeply interested in arctic voyages, and I have followed closely this expedition. The "Jeannette," formerly named the "Pandora" left San Francisco after being restrengthened on the 8th of July, 1879, for the North Pole, by the Straits of Behring.

Capt. De Long. I give him credit for the route that we have now before us in which consists the first link of work of Nature. Capt. De Long was a young man of remarkable perseverance, he proved it in a letter that he wrote to Mr. Gordon Bennett, proprietor of "The New York Herald," who sent out the "Jeannette."

He says the current will take us north the same as the whalers, but it will be more difficult to get back. This shows

us great courage on the part of Capt. De Long, to leave for a place from which he could see no way to get back.

The "Jeannette" was beset in the ice of the 7th of September, 1879, and from that date Nature had charge of the "Jeannette" until she was crushed by the ice pressure on the 11th of June, 1881. Chief Engineer Melville's boat, landing on Henrietta Island. Capt. De Long and crew left the ship on the 12th June, with five boats and nine sledges, and after 104 days of hard travelling, two boats succeeded in landing in the River Lena.

When the "Jeannette" sunk, some relics were left on the ice, and strange to say, these relics were found some 2,900 miles away from where the "Jeanette" sunk, at Julian Head, some three years afterwards. These relics must have travelled at the rate of about 2 miles per day and this is in accordance with the last 3 months of the "Jeannette" drift.

If the crew of the "Jeannette" had saved provisions enough and stopped on the ice they would have drifted to Greenland the same as the relics.

SECOND LINK OF DRIFT.

Here we see Dr. Nansen, to whom we owe a deep debt of gratitude, and Capt. Otto Sverdorp, with the "Fram."

A vessel especially built for Arctic exploration, she left Norway June 25, 1893, and entered the "Kara Sea," sailing along the coast of Siberia as far as the New Siberian Islands, and the 21st of Sept. of the same year the "Fram" was made fast in the ice in latitude 78° 30′ North. From this time the "Fram" was frozen into the pack ice, and Nature drifted her across the Polar Basin towards Greenland, at about North 36 degrees West, in a little less than three years.

On the 14th March, 1895, Dr. Nansen and Lieutenant Johansen left the "Fram" with twenty-eight dogs and three sledges, to go to the North Pole, some 360 miles distant.

Here Capt. Bernier pointed to the following diagrams and pictures:

This shows us the state of travelling in that part.

Dr. Nansen, furthest north, 86.14.

The temperature monthly.

The mean temperature of the twenty-four hours.

Arriving at Franz Joseph Land in Kayaks.

Meeting of Dr. Nansen, with Mr. Frederick Jackson.

The state of the ice during October, 1893.

This illustrates the work of Nature helped by Science.

The combined experience of others who have ventured in the Polar Regions teaches us precisely what the conditions are that we have to cope with, and how they are to be overcome and I maintain that we now know that the Polar Regions can be surveyed and the Pole reached.

Since the Fram returned, certain weaknesses have been discovered in her forward deck, and in her steam power. I have decided to increase both my steam and sail power. I do not intend to use full steam power until we get into the ice, when I will use the steam to force the way to the North. I intend to increase the resistance of the vessel by adding another row of beams all along the ship. The main beams will be level with the ice, so that the pressure will be carried on the main beams. I will also strengthen the engine room by the addition of some temporary beams, and also by some fixed beams. I will burn four and a half tons of coal, as compared with the Fram's four tons, and with that I will be able to get more power when needed. We have to be very saving of our coal, because four years is a long time. We will have a distiller connected with our cooking stoves, so that we will be able to distil salt water, in order to obtain fresh water, when we have not got snow to melt. And even the snow has a certain amount of salt in it. We will have a good deal of condensed food for our sleigh expeditions. My intention is to endeavor to reach the Pole by sleighs and small boats. The boats will be portable boats, similar to Nansen's, but improved. The sleighs will be built for carrying oil, and will be non-sinkable. Each one will be a combined boat and sleigh, and when there is wind, we will utilize sails on them.

I think I could reach the Pole in one season and come back the next, but I do not approve of the route I should have to take, because no scientific results would follow. I put this statement before the public because it was thought that three or four years' absence was too long. The answer to that is that it could be done in a shorter time, but the necessary results would not be obtained. Since this short route was first spoken of it has been tried by Mr. Wellman, and by the Duke of Abruzzi, and now our American cousin, Mr. Evelyn Baldwin, is making an attempt on similar lines; and if he is prepared to spend the whole year there is no doubt he may reach the Pole.

I intend to take a crew of fourteen men,—including scientists. Fourteen men can handle the boat until we reach the ice and after we get to the ice there is no navigation to be done; the only work then will be to get in the leads, to cut channels and to keep the vessel free from ice. The first year we will have nothing to do but to keep the ship free from ice, and prepare her for wintering and look after her generally; at the same time taking soundings and whatever observations there are to be had. I intend to take photographs to show the formation of the ice; of the aurora borealis and of the moving ice. We will also have a graphophone to register noises made by the ice and at the same time register the noises made by any one of our party who gets in the blues, so that later, when we come back, we will be able to say, Mr. So and So on such a date had the blues. By doing this it is altogether likely no one will have the blues.

PLAN OF PROPOSED EXPEDITION.

Approved by the Quebec Geographical Society.

I propose to build a special vessel about 300 tons register, and to have a party of scientific men, and the best seamen obtainable.

Guided by the experience of Capt. De Long, Dr. Nansen, Prof. Nordenskjol, Prof. Baron Toll, Sir Clements Markham, and other eminent men of England and America, I believe that we can undertake this voyage with certitude that the result will be of some benefit to our fellow-men, and to science and commerce in general.

We hope to sail from Vancouver or Victoria, calling at St. Michael, or Port Clarence, to send our last dispatches and take in the balance of our stores.

Entering the Strait of Behring in about July, following the Coast of Siberia, and entering the ice between 170 to 165 degrees east as its state may permit, we will push north as far as possible in August and September, dropping buoys with records at intervals to test the ice drift. We propose to send one small balloon messenger every month with records, when the wind suits, so that the world at large may get news of the expedition. Every balloon will have a copy of the records sent in the former balloons. All possible photographs of everything we see will be taken, using kites for taking long distance-photos, so that we can see in fine weather the leads. Soundings, dredging, and other scientific observations will be recorded.

Once in the hands of Jack Frost, we would prepare for the worst; with suitable appliances, it is known that we can run long distances on the packed ice, during its proper season.

In our second spring and summer we would make two different routes, one in the north-east direction, and the other in a south-west direction, with stations at different places, so that we can keep in communication with the ship with wireless telegraphy and gun-signals when weather permits. These two different routes will be staffed at every mile. The staffs will be hollow, and part of them filled with condensed provisions, each one bearing a number and record, so that the passage of each party will be recorded. At the 50 mile station, soundings and weather records will be taken at intervals, and other observations.

When in the neighborhood of the Pole, the N.E. route will be extended to one or two more stations, as we may require, always being in communication with the ship and the stations. In this way I think we can reach 90 degrees North with certainty.

We know that dogs are the horses of the Arctic, and we shall have a small number of them, just sufficient to haul our material and stores. Having three years before us, we may count on a natural increase in the number. We must have also several boats.

A boat in section in case the ship will be lost.

But some of these boats are small and portable, so that they can be used for crossing openings, which are many sometimes, but as we are not in a hurry we can take our time to get along. We know we have our ship to fall back upon at any time when necessary. In all directions in which man has penetrated to the uttermost northern point of the north he has met the sea.

Will Great Britain and Canada reap this fruit, or shall we allow other countries to anticipate us ?

It is Canada's most northern limit, and we are bound in our own interests to attempt it.

We Canadians are willing to sacrifice a good deal and I hope will undertake it.

What we learn from the Mother Country we are ready to return with interest, and what a grand voyage it would be to start from Canada via the North Pole to England, coming back with a precious cargo of records of the unknown part of the Polar regions.

Our friend, Commander Scott, with the "Discovery' will do the same in the Antarctic Sea. If I turn my back to Capt. Scott on leaving, I hope it will only be for a short time when we shall meet again, each with a fine record.

I must say here, that in 1896 I proposed two plans. Plan No. 1, by the Strait of Behring, and Plan No. 2, by Franz Joseph Land to the Pole, and returning to Spitzbergen, but the Quebec Geographical Society preferred Plan No. 1, because it would bring better results.

To quote the words of Sir Clements Markham, President of the Royal Geographical Society before the Royal Geographical Society, London, May, 1897.

"There is, however, still much to learn. An expedition should be sent up Jones Sound to connect the 400 miles between Prince Patrick Island and Aldrich's furthest, and to examine the line of ancient ice in that unknown region. Another expedition should complete the examination of the northern side of Greenland. A third should be equipped on Nansen's plan, and sent to carry out Nansen's principle, by commencing the drift much further to the eastward, and passing over the Pole itself. This would probably occupy 4 years, but it would bring back a further instalment of knowledge of the vast unknown area and another series of magnetic observations. It should also decide the question of the existence of land between Prince Patrick and Wrangel Islands. It is true, therefore, that much remains to be done. Still, we have a large mass of facts respecting the Polar regions, from which scientific deductions may be drawn, and this has been enriched and materially increased by the labors of Dr. Nansen and his gallant companions."

In May, 1898, Dr. Nansen proposed a new route to reach the Pole and described how the Pole will be reached going by the Strait of Behring, by commencing the drift more to the eastward.

Allow me to give you a few views relating to your humble servant.

Here is the old City of Quebec, at one time the cradle of shipping in Canada, and so well represented at the Federal Government, by our Premier, Sir Wilfrid Laurier, and the Hon. R. R. Dobell, and the Honorable Solicitor-General, Mr. Fitzpatrick.

Next, my house in Canada—but let me tell you the home of the sailor is the sea, and he should be at home and contented everywhere.

Your humble servant's library at home.

"Man proposes, and God disposes." No matter what his rank or position may be, the lover of good books is the richest and the happiest of the children of men.

Having left home at the age of 12, I had not the opportunity to learn very much; finding that I was at a discount with my fellowmen, I made up my mind to study and pay for my own learning. I am very ignorant yet, but I mean to learn more.

"Knowledge, the wing wherewith we fly to heaven."

—(Shakespeare).

I am lured by no hope of gain, influenced by no spirit of conquest, but I am moved solely by the belief that man should know even the most desolate regions of his abiding place, the earth, and with the determination that the British Canadians shall do their part.

The globe is a chartered ship for the future, and richly loaded. The earth was made for man to utilize for his own good, and God gave him his own free will to go where he likes. Some men stop on the way, some go farther and farther, and it is a race to see this earth and to find our wants and pleasures.

My Motto:—

"Aime Dieu et va ton chemin"—"Love God and go thy way."

The greatest part of our knowledge comes from the Mother Country and old Europe; you can see the sun rising in the east, that means knowledge. "If we studied nature more we would succeed better." For everything on earth is for us. We have only to help ourselves and make the best of it, and the unknown Arctic area is well worth the having for purely practical purposes if for no other, because the available wealth of this northern world is by no means exhausted.

With your kind permission I will show you, so that you can know me better, a sketch of my forefathers which will show you that the spirit of the Navigator has been thoroughly instilled into your humble servant.

My grandfather (Capt. J. B. Bernier), at the age of 86, having commanded over 50 years.

Jean-Baptiste Bernier, a pilot for 53 years in the River St. Lawrence, at the age of 80.

Capt. Joseph Bernier, at the age of 71, was master for 40 years.

Capt. Louis Bernier, at the age of 60, in command of the Revenue Cutter, " La Canadienne."

Captain Thomas Bernier (my father), at the age of 70; he was master for 43 years.

Capt. Joseph E. Bernier—your humble servant. Master of the Deep Sea Vessel at the age of 17.

Your humble servant who has undertaken to sail from the Strait of Behring towards the Atlantic, for a scientific voyage, and to attain the highest possible latitude. I now offer my services to Canada.

Mr. President, allow me to thank you most gratefully for having honored my lecture by your presence.

Gentlemen of the Association of Ontario Land Surveyors, I also thank you for your kind attention.

Mr. President and Gentlemen of the Association of Ontario Land Surveyors, I thank you for the privilege you have given me of addressing you to-day, and for the sympathetic and intelligent interest you have shewn in the subject on which I have spoken.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

LEVEL OF LAKE ERIE.

BY F. W. FARNCOMB, O.L.S., LONDON.

The necessity for increasing the safety, certainty, and facility of the navigation of the Great Lakes and the Deep Waterways between them and the Atlantic tide waters, is one of the great undertakings of international importance which will require the immediate action of the Canadian and the United States Governments. The comparatively great variation, both annual and periodical, in the height of the water, in Lake Erie alone, involves enormous loss to the shipping interests as well as the expenditure of millions of dollars in deepening harbors, channels and waterways.

How to regulate or minimize this variation is the subject of a special and exhaustive report by Mr. G. Y. Wisner, a member of the United States Board of Engineers on Deep Waterways, from data gathered by this board, and endorsed by his colleagues, as a preliminary report upon the whole subject to be investigated, for which the necessary data and conclusions have not been completed. Records taken at Cleveland since the year 1865, up to the year 1898 inclusive, show that the mean elevation of the water in Lake Erie above mean tide at New York is 572.4 feet, and using the same datum, the highest mean monthly water mark, which was reached in 1876, is 574.3 feet, and the low water mark, reached in 1895 and 1896, was 570.6 feet. The greatest variation in the height of the water in the last thirty-five years was therefore 3.7 feet, and the mean annual variation, which continues about the same in recent years, is about 20 inches. The chief source of supply to Lake Erie is drawn from the great lakes above, which, with their respective watersheds, include an area of over 150,000 square miles, or about six times the area of Lake Erie and watershed; it is therefore the fluctuation in the supply from these lakes due to varying rainfall, ice, etc., which practically governs the variation of its water level. The flood water, pouring into the upper end from the Detroit River, the lake water at normal height must rise until the sectional area and slope of the upper portion of the Niagara River, which forms the outlet, is increased till its

capacity is equal to the increased supply from above, when the lake water level becomes once more stationary until the conditions are again changed.

It is evident that no matter what system be adopted for regulating the water to a uniform height, or in other words making the discharge equal to the supply, that the capacity of the Niagara River must be increased below the required lake level so that it will at all stages be sufficient to carry off the maximum supply. It is also evident that this can only be accomplished by deepening or widening its bed for a certain distance, or by raising the water in the lake above the river bed until a like result is obtained. With this result accomplished, by either method, means must be devised to regulate the discharge into this huge tail race, when its full capacity is not required, so that it will equal the volume of water flowing into the lake. This can only be done by means of a dam and flood gates in either case. For economical reasons alone, therefore, the scheme recommended for raising the water to or near high water mark, seems to be the proper one, apart from all important questions of the actual height which will be most convenient and beneficial to the majority of interests that will be affected.

By means of accurately measured cross sections of the river and careful observations taken at different stages of the water level, the volume of each mean monthly discharge from the lake has been accurately determined from the year 1865 to the year 1898 inclusively, and from these results the necessary height of the proposed submerged weir and width of sluice gates have been calculated, which fixes the height to which the water will have to be raised and maintained at 574.5 feet, or a little over 2 feet above the mean elevation and about 2 inches over high water mark for the period referred to, which was reached in the year 1876. The location chosen for the proposed fixed weir and sluices will follow a rock reef which extends into the river from the break-water of Black Rock Harbor, Buffalo, for a distance of about 1,300 feet and then deflecting about 35 degrees northerly, and running in at right angles to the Canadian shore, a total distance of 2.810 feet. Of this 1,600 feet will be a fixed weir, 1,040 feet will be sluice openings, and the remainder will be taken up by sluice gate piers. About 1,200 feet of the reef will be utilized at a small cost for the proposed weir as it is about the required height, viz.:—6.6 feet below the surface of the water when regulated to the height proposed. The river bed deepens suddenly at the end of this rock, and it is from there the piers and

sluice gates will be placed. They will be 13 in number, 80 feet each in width, and have a depth of 20 to 24 feet. To each gate will be attached suitable hoisting gear, and counter weights so arranged that the variation in weight due to immersion will be so equalized that the hoisting gear will only be required to overcome the friction, etc. So nicely will this adjustment be made, that it is stated two men only will be required to operate each sluice and the whole system will be opened in three quarters of an hour. The piers, 52 feet long and 12 feet in width will be built of concrete faced with granite, and paving stone will be carried up 9½ feet above the water and upon these the steel superstructure, 40 feet in height, to carry the weights and hoisting gear will be placed. The weir will be made with concrete, 5 feet wide on top with rounded crest with upper side sloped one to one, the lower side vertical, and both sides filled in with large stones. The foundation is upon rock-bottom throughout.

In calculating the discharge in the last 35 years, it is estimated that the mean monthly discharge was 220,430 cubic feet per second, and the greatest mean discharge for the first six months (which occurred in 1876), 285,200 cubic feet per second. The volume of discharge over the weir with the water at 574.5 feet will be 113,400 cubic feet per second, which can be increased at will up to 159,500 cubic feet per second by opening the sluice gates and making the total discharge 272,900 cubic feet per second, exceeding by 1,900 cubic feet per second, the average supply for the storage season for any year excepting 1876. But it is pointed out that in the last 6 months of the year the discharge was 60,000 cubic feet per second less than the capacity of the proposed regulating works, which could then have lowered the water one foot in two months, and that this contingency, as well as those in the future, could be readily dealt with by lowering the water sufficiently during the season of limited supply, after navigation closes.

In conjunction with this work a channel and lock will be necessary on the Buffalo side of the river to a point below the gorge where it widens and the current is slower, in order that vessels may pass around the works and at the same time do away with the present dangers and difficulty in navigating the shoals and swift current in this part of the river. The estimated cost of the regulating work is about $800,000, while the cost of the 17 foot channel and lock, 600 feet by 60 feet by 21 feet, is estimated at about $1,600,000, or about $2,400,000 in all. The probable effect of the proposed works upon the lakes and waterways above

and below is also one of great interest and importance. Perhaps the latter is more particularly so to Canada, for any further lowering of the waters of Lake Ontario and the St. Lawrence River would almost amount to a national calamity. While the report is not conclusive upon this particular point, the investigations in that respect not having been completed, it is claimed that regulation will not materially change the annual discharge through the Niagara River, and will only modify the distribution of flow about 5 per cent. of the average discharge, and therefore cannot materially affect the level of Lake Ontario and the St. Lawrence.

It seems that through the deepenings of the channels of the St. Clair and Detroit Rivers in recent years, the low water levels of Lakes Huron, and Michigan have been lowered one foot. It is estimated that the direct result of raising the level in Lake Erie 3 feet will be a corresponding rise of 2 feet in Lake St. Clair and one foot in Lakes Huron and Michigan, thus restoring to the latter their former natural low water level previous to the year 1886, and at the same time diminish the fluctations of these lakes one foot. It is shown also in favor of this scheme that the aggregate cost of improving Lake Erie harbors alone has averaged $1,000,000, for every foot in depth of permanent improvement, and also that the enlargement of the navigable channels of the St. Clair and Detroit River to a width of 600 feet, is at present a matter of urgent necessity, and the favorable effect that the proposed work would have in this instance also is apparent. The report states that the stage at which the lake level would be regulated, that is with an elevation of 574.5 feet above mean tide water, would be 6 inches below high water mark, but the date upon which this height was reached does not appear to be given.

DISCUSSION.

Mr. A. R. Davis:—I think we are deeply indebted to the writer for this paper on a subject that has arrested the attention not only of our Engineers but of the American Engineers. The Deep Water Ways Commission, composed of eminent Engineers has been looking into the matter of the water levels of the Upper Lakes now for several years. And we know that the canal at Chicago has been a question of grave fear on the part of the Engineers in reference to the levels of the Upper

Lakes. We hear now that the complaint of the people on the Mississippi River is that the sewage of Chicago is being carried down the Mississippi and is very gravely interfering with the purity of the water. That of course indicates the drainage of the waters of the Upper Lakes to the westward and southward.

An important question with us here is the level of Lake Ontario. If a dam is thrown across the Niagara River it will interfere with the discharge to a greater or lesser extent and consequently with the levels of Lake Ontario. The writer of this paper points out that difference in discharge is going to be very slight. I think he says it would be only some five per cent. I cannot see why such a discharge should be allowed if it is thought necessary to construct a dam there of such magnitude.

This is a question we are all concerned in, and we are indebted to the writer for giving us this very able paper; and I

Mr. H. H. Gibson:

There is one point mentioned by the writer of the paper that I would like to speak of. He says that Lake St. Clair, Lake Huron and Lake Superior—and I suppose Lake Michigan—would be raised one foot each in their level. Can any one here explain how it could occur, that the level of these Lakes which run into Lake Erie with a fall from each river would be raised.

Mr. A. R. Davis:—He claims that by raising the level of Lake Erie three feet at the bottom you would raise the level of Lake Michigan one foot.

Mr. H. H. Gibson:—Is there only that much fall in the River ?

Mr. A. R. Davis:—That is the inference.

Mr. H. H. Gibson:—Yes, but I thought it was more than that.

President Ross:—This paper is founded on a preliminary report only. The Deep Water Ways Commission has been taking soundings and obtaining information, and are doing so still, since the date given here of this preliminary report. I have seen them myself at work there with a tug in the River. This report deals with what is called damming the Niagara River, a thing which people many years ago thought was a preposterous proposition. When the final report of this Deep Water Ways Commission is published there will be a great deal more information given. One point that Mr. Farncomb has not taken into consideration,

this is, the action of the wind on Lake Erie. When there is a strong south-west wind the water is piled up there to the easterly end of the Lake, at Buffalo and all along the Canadian shore, and at Port Colborne, and towards the easterly end of the Lake. The water rises very materially, perhaps two or three feet; and then the Niagara River rises in the narrow places; just below the Falls, perhaps it will rise 15 feet in one heavy storm. This paper deals with Lake Erie as if it were a mill-pond that the wind did not affect very much. But the action of the wind really affects Lake Erie very considerably.

Mr. A. R. Davis:—Who is concerned in the construction of this dam ?

President Ross:—The Deep Water Ways Commission is a United States Government Commission. There was a joint meeting of Canadian and American Commissioners, but I think what is being done now is being done by the American Commissioner altogether.

There is another point that Mr. Farncomb has not touched on, that is, the damages that would have to be paid to the owners of lands in the vicinity of Lake Erie. There is a large acreage of comparatively low lands in the vicinity of Lake Erie that are only about three or four feet above the average level of the Lake; these lands are now cultivated and drained and if Lake Erie were raised nearly four feet vast tracts of land would be flooded and there would be quite a bill for damages.

The idea of raising the level of these Lakes is quite a good one; I suppose it is easier to raise the waters of the lake than to be continually deepening the waters of the harbors as has to be done in view of the fact that boats of much greater draught are being used now, boats of twenty feet and probably a greater draught have to come into our harbors. Port Colborne Harbor is being deepened now by the Dominion Government to a depth of twenty feet although the canals are still only fourteen feet in depth.

Mr. H. H. Gibson:—Was not the intention in building this submarine weir to raise it to a normal level, not to raise it beyond the original height that they suppose the lake stood at ? In that case there would be no damages.

President Ross:—I do not know about that; you might have to go back into the history of the lake.

Mr. H. H. Gibson:—I mean of recent times.

President Ross:—Not that anybody remembers.

Mr. H. H. Gibson:—I thought that was the intention all through the paper.

President Ross:—There is a great area of land now cultivated that could not be cultivated if the lake were raised; and the people who are making a profit off that land would be, I think, entitled to damages. However, that is a question for the lawyers.

Mr. H. H. Gibson:—They are probably using land that belongs to the Government.

President Ross:—No, this land is above the average high water mark. I do not suppose high water mark would mean the highest level.

Mr. H. H. Gibson:—It would not mean flood water.

President Ross:—That is, water piled up by the action of the wind ?

Mr. Gibson:—Yes.

President Ross:—No, it would not mean that. Of course high water mark is very difficult to define.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

SURVEYING BY PHOTOGRAPHY.

BY J. N. WALLACE, O.L.S., D.L.S.

Considering the fact that Canada possesses in the Rocky Mountains some of the most difficult country in the world to survey, it is strange that even amongst surveyors, there should not be a more general knowledge of the method known as photographic surveying, which is so well adapted to rugged districts. This method is of interest not only to surveyors but to photographers as well, for the latter can fairly claim that by its use surveying has been added to the already long list of sciences which are indebted to the art of photography. There can be little doubt that the general want of knowledge of the method is due to the mistaken idea that its practice is involved in mathematics. No doubt some effort is required at first, to realize the general relations of a photograph to the actual country, but the theoretic knowledge necessary for the practice of surveying by photography is not very extensive nor difficult for a surveyor to acquire. It must not be supposed that proficiency in the practical art is so easily gained, for its difficulties are such that natural aptitude and a large experience in the field are necessary to overcome them.

The use of photography for surveying purposes is much older than is popularly supposed. So far back as 1860, the idea was practically developed by Colonel Laussedat, but its use has been very restricted. Surveys to a small extent have been carried out in several European countries, notably in the Italian Alps, where the lower parts of the mountains have been surveyed by the plane table and the higher altitudes by photography. None of these surveys, however, approach the extent of the Canadian surveys. Under the direction of Mr. Deville, the Surveyor-General of Dominion Lands, who originated the use of the method in Canada, photographic surveys already have covered over 25,000 square miles in the foothills of the Rockies and in the mountains themselves in British Columbia and the Yukon. These were commenced in 1887 and have been ex-

tended almost every year since then. The foothills surveys include the area between the prairie and the Rockies, from Calgary southwards to near Macleod, covering about 2,000 square miles of country varying in altitude from 3,600 to 8,000 feet. These surveys are plotted with great detail, and are used in connection with irrigation works. About 20,000 square miles of the boundary country between Canada and Alaska have been surveyed in a preliminary manner, and besides extensive surveys along the railway belt in British Columbia, photography has been applied to the survey of part of the country forming the north boundary of British Columbia, and more recently to the survey of the celebrated Crow's Nest coal area.

The photographic method receives its best application in the survey of mountainous districts, for the very ruggedness of such countries, which proves a barrier to ordinary methods of survey, is itself an advantage when we use photography, as it affords stations from which commanding views can be obtained. The chief characteristic of the method is its ability to make a rapid record of the positions of inaccessible points, and hence the more inaccessible and numerous these points the more fully are its advantages developed. There are, however, cases where it can be well used apart from mountains, when we wish to make a survey of anything lying in one horizontal plane or nearly so, which can be overlooked from suitable stations. Such cases may occur in the survey of a rocky coast-line, the shores of a lake, the windings of a river in a deep valley, etc. In such cases, by means of the perspectometer instrument, we can deduce the horizontal plan from the vertical photograph very easily and rapidly.

In considering the general principles of photographic surveying, it may be well to first of all point out the relation existing between the positions of objects in a country, as seen from a camera station, and the positions of the corresponding points in the photograph. We may suppose a surveying camera, so levelled that the plate is exactly in a vertical plane, to be set up on some mountain peak, and a view to be taken of a range across a valley. We know that an image of the distant scene is formed, by the lens, at a distance behind it equal to its focal length, that is, on the sensitized plate. We also know that the points in this image are so situate that a line drawn from any object to the so-called centre of the camera lens and continued onwards will pass through the corresponding point in

the image. Considering a whole series of such lines drawn from the various objects through the centre of the lens, we may regard the image on the sensitized plate as consisting of the points of intersection on the plate of all the lines of sight from the centre of the lens to the objects in the landscape.

We may now suppose a transparent screen to be placed at a distance, in front of the centre of the lens, equal to its focal length, and to be exactly parallel to the sensitized plate. The eye placed at the position of the lens and looking through the screen would see the landscape as it were projected on the screen. Such a picture, being formed by the intersection of the various lines of sight on a plane parallel to the plate and equally distant from the centre of the lens, would therefore be exactly similar to the image on the plate. We could, therefore, replace the picture on the screen by superimposing a finished print taken from the negative. By imagining lines drawn from the centre of the lens to the print so placed on the screen, we can realize how it is that a photograph gives a graphic record of the different lines of sight to all the visible objects, as seen from the camera station.

In order to make use of this record we must have some basis to work on. In the case of every photograph, in addition to the known focal length, which is constant, we must know three things. Firstly, where is the horizon line, that is, where would a horizontal plane through the centre of the lens have intersected the negative while the photograph was actually being taken. Secondly, we must know where the axis of the lens (that is, "the line of sight" of the camera) intersected the negative. This is called the principal point and is always on the horizon line so long as the plate was exposed vertically. A vertical line across the negative through the principal point is called the principal line. These two lines quarter the negative. As the screen picture is similar and similarly placed to the negative, these lines will occupy similar positions on it. Lastly, we must always know the absolute azimuth of the line of sight of the camera for each exposure. While in reality the picture of the landscape is recorded behind the lens, it is much easier to grasp the general principles if we suppose it to have been recorded on the imaginary screen placed parallel to the plate and in front of the lens.

There are very many forms of cameras for surveying purposes, which may be roughly classified as those which are simply

cameras, and those which have in conjunction some means of measuring horizontal or vertical angles or both. The Canadian Camera is of the first class, so that it is always accompanied by a second instrument to measure angles. Generally a 3-inch transit fitting on the camera tripod is used, and angles are measured immediately after the views have been taken by simply replacing the camera by the transit, without disturbing the tripod. The camera itself consists of a plain rectangular box, with no focussing arrangement, being composed of a metal framework, surrounded by mahogany. It can be used, like ordinary cameras, either with the long edge of the plate horizontal or vertical. On two adjacent sides are a pair of levels at right angles, one of each parallel to, and one transverse to the line of sight of the camera. One pair is always on top and the other pair neglected for the time. When a plate is exposed it is pressed against a rectangular metal border in front of it. In this frame, appearing in every print as a black border, are four small nicks in the approximate centre of the four sides. These nicks are so placed that the lines joining opposite pairs are at right angles, and their intersection is at the principal point. The placing of these nicks to fulfil these two conditions is of the nature of a permanent adjustment, and will not be discussed here. With the nicks so placed, the camera can be levelled so that a horizontal plane, containing the axis of the lens, will pass through the nicks. The principal line must then pass through the top and bottom nicks. As the spirit levels cannot be adjusted in the usual way, being fixtures, it is necessary to find instead the position which the bubbles must occupy in the level tubes, when the two side nicks inside the camera are horizontal. The levels parallel to the line of sight have only one function, namely, to place the plate in a vertical plane, one level being used for each position of the camera. The position of the bubble in each of these levels when the plate is vertical is found, at the commencement of the season's work, by an experiment somewhat analogous to that by which the zenith can be found in an astronomical observatory. Having been once found, the bubble is always placed in the same position, and we know that the plate is vertical whenever an exposure is made. The position of the bubble in each of the transverse levels, when the nicks are horizontal, is also found once for the season's work. When the bubbles have been so placed at every exposure of a plate during the course of the survey, we know that the horizontal and principal lines must have passed

through the nicks, and we can at once so draw them on the prints subsequently made.

If the proper position of the bubbles were not known during the survey, we need only assume positions for each of the four levels. These being used throughout the survey we can subsequently, by an experiment, find the positions of the horizon and principal lines, relatively to the nicks for the particular placing of the bubbles used throughout, and then draw these lines in similar positions for all the prints.

There is therefore no practical difficulty in drawing these lines on the prints, for they are at once drawn in similar positions for all the prints. Their positions can, however, be independently checked for each separate print, if required.

The finished print with the horizon and principal lines drawn on it in their correct positions, may now be supposed to occupy the place of the screen picture in front of the camera lens in the field. Each point in the print is now exactly on the line of sight from the lens to the corresponding object. Every object whose image lies on the horizon line of the print has the same apparent elevation as the lens, and from the distances of the other image points above or below the horizon line, we can deduce the altitude of the object relatively to that of the station by the principle of similar triangles. By drawing verticals from each point to the horizon line, we have a series of points along that line which gives the horizontal angles between the lines of sight to the objects. The azimuths to these various objects would then be all known if we knew the azimuth to one. This is found, for each view, by setting up the transit and reading the angles to at least one prominent object in each view, such as an isolated peak, which can be recognized subsequently in the print. At the same time a reading being taken to one of the other triangulation stations, we have the azimuth of each of the "arientation" points selected in the views. When the print is made, we first recognize the point we selected in the field, and then draw a vertical from it to the horizon line. From the position of the foot of this perpendicular, relatively to the position of the principal point, we can deduce the azimuth of the principal point itself, by a graphic construction.

From what has been just said, the method of plotting the survey will be apparent. The triangulation and camera stations being laid down on the plan in the usual way, a line is drawn

from the camera station in the direction of the line of sight of the camera when the particular photograph was taken in the field. On this line a point is marked at a distance from the plotted station equal to the known focal length, and here a second line is drawn perpendicularly. This last line has now the same relation to the plotted camera station, both in distance and arientation that the horizon line on the screen picture had to the centre of the lens in the field. By laying off on it the same series of points as we obtained from the verticals on the horizon line and drawing lines from the plotted station to these points, we have a series of lines representing the azimuths to all the objects selected. The same procedure being gone through for a second photograph, taken at another station and including the same points, gives a second series of radiating lines. Corresponding intersections finally establish the positions on the plan.

The prints are enlarged in the linear ratio of 2.1 to 1, forming prints about 13 inches by 9 inches. In the metal border, surrounding the plate, the focal length is exactly marked off, so that, by this ingenious arrangement, this length is similarly enlarged when the print is made. It is really this enlarged focal length, or "distance line," which is used when plotting the plan, thus preserving constant the ratio between the distances apart of points on the negative and the actual focal length. The effect of enlarging a print is the same as though the screen picture was moved proportionately far away from the lens.

As the points are plotted by intersections of lines of sight to the same points from two stations, similar points must be recognized in two views. This matter of identification is easy or difficult according to the angle between the two lines of sight, the nature of the scenery and the quality of the photographs. When the relative positions of points in two photographs are much changed, the only way is to regularly follow similar ridges in each print, the identification of one point then leading to another, and so on. In this way many points can be recognized, which could not be done, if we proceeded in a haphazard way. Both the ability to select points capable of identification, and identification itself are largely extended by practice.

A sufficient number of well-selected points being plotted, the elevations of all or some are found relatively to the camera station, by the principle of similar triangles. The elevation of the station having been found by trigonometric levelling,

a simple addition or subtraction gives the absolute elevation. We now have the positions and elevations of the salient points, and proceed to draw the contours by interpolation for every 100 feet or 200 feet as the case may be. Plans of mountainous countries consist almost entirely of these, and the watercourses. Enough points cannot be accurately located on the plan to draw the contours by these alone. Whatever the method of survey, the smaller details must be drawn by estimation. For this reason, in judging different methods, a great advantage must attach to that method which enables the topographer to estimate most closely. Photography has here a great advantage over its rival the plane table, for by having two or more photographs showing the country from different points of view to which he can refer as often as required, the topographer can arrive at a very much truer knowledge of the details than when using the plane table, which is restricted to one point of view at a time.

On the other hand it is claimed that it is easier to contour details with the actual country before you than from a photograph. In this connection it must be remembered that what we see, when in the field, is little more than a perspective. It is by our knowledge of the laws of perspective (probably acquired unconsciously) that we derive nearly all our ideas as to what would be its horizontal plan, when we look at a view, whether the view is a landscape or the interior of a room. It is true it is difficult to represent on a horizontal plan what is presented to us on a vertical photograph, but it is also true that our own eyes can only see the projection in the field, and similar difficulties arise when contouring there. With a photograph, whose distance line equals the distance of distinct vision (about ten inches), the sizes of objects as seen in the photograph are the same as their apparent sizes when we look at the landscape itself. It is only in lack of brightness and definition and want of coloring that a photograph is inferior to the actual view.

It must be admitted that here we have perhaps the greatest objection to the photographic method of surveying, for it is not possible, in the present state of science, to obtain a photograph as clear as the actual view, and it is often difficult to get even good photographs at all. Beside the usual defects of all lenses, plates and prints, the defects of the weather are peculiarly trying to a surveyor. He must largely take it as it

comes. The weather may be bad for days, or it may occur that, after a laborious climb to some peak, the day, which promised well, may suddenly change, and the surveyor must either take the photographs under poor conditions or else lose a day. Almost any defect in the weather has a worse effect on photography than on natural vision, and so long as this is so, an objection can always be urged against this method of survey.

Unfavorable weather conditions are caused by want of sunshine, fog, smoke in some localities and the blue haze at high altitudes. The last is partly neutralized by placing an orange glass in front of the lens. This stops the blue light diffused by the atmosphere, so that the light which reaches the plate is that coming from the objects themselves and not that originating in the intervening air. Such a screen has the bad effect of markedly increasing the shadows, for objects in shadow are nearly entirely illuminated by the atmosphere and such light cannot pass the screen. The result is that a valley in shadow shows up poorly, unless the extreme limit of exposure for the bright lights is allowed.

The time of exposure is a difficult matter to decide, varying greatly with the light, the scenery and the altitude. The effect of a particular light on eyesight is not a good test of its effect on a photographic plate, especially behind an orange screen.

The Canadian Camera is carried in the field in a box also containing a dozen plates, the whole weighing about twenty pounds. Single plateholders are used, and the plates changed at night under a canopy hung from the inside of the tent. An arrangement by which plateholders could be re-filled in daylight would be a great improvement, saving the surveyor the alternative of having to come down to his camp in the valley each night, or else having to carry a special tent up the mountain. Cramer's isochromatic plates are used, 4¾ in. x 6½ in. By isochromatic is meant a plate which is sensitive to the different colors more in proportion to their illuminating effect than is the case with ordinary plates, which are almost entirely acted on by the non-luminous rays. Such plates give results more nearly approaching the effect of natural vision. The lens is a Zeiss anastigmat, consisting of two doublets, with an equivalent focal length of 5⅝ inches. The enlarged prints therefore have a distance line of about twelve inches, a little greater than the distance of distinct vision. The stop used is F 36, a

slightly smaller stop than No. 64 in the "Uniform System." The enlargements are made on bromide paper. On account of the small stop, the orange screen, and the slow plates, exposure is long, varying from fifteen seconds for a midday sun in June to as much as three minutes for a dull day later in the season. The scope of the lens is such that seven views give a complete circle, with a small overlap for each.

The preliminary triangulation work in a photographic survey does not greatly differ from that usually employed. The triangulation stations being on high peaks, usually afford good camera stations, and they in addition to others are so used. A sharp peak offers the best site. Flat topped mountains, especially if timbered, are very objectionable. If they exist only in isolated groups they may usually be surveyed from camera stations situate on more favorable neighboring ranges. It is a general rule that a ridge is not surveyed by camera stations on itself.

With regard to the distance which may be safely included in a view, this will depend on the state of the weather and the detail required. Speaking generally, sufficient detail for a good plan of a rugged country can be obtained if the points are not over three miles away. Greater detail would be unnecessary in the survey of rugged districts. The principal shoulders and the watercourses down the sides of the mountains can be well plotted from good photographs up to six miles. Beyond that we can only expect to obtain a general idea of the country. The position of the camera stations, however, is more often described by the necessity of seeing up valleys beyond intervening ridges, than by the question of how far the details can be made out. Every part of the country must also be covered twice, from two stations whose distance apart forms a suitable base. It must be remembered that although we may be able to see points in a photograph up to six miles, it does not follow that one camera station can survey a circle of six miles radius. Around each camera station there is always a large space too close to be surveyed. When points approach the base line between two stations, although they may be clearly seen in the photograph, the lines of sight to them from the two stations make too obtuse an angle to allow of proper identification. Identification, even with good photographs, is difficult and involves much loss of time if the lines of sight to the points intersect at a greater angle than forty degrees. The aspect of the country is

too much altered in the two photographs to allow enough points to be identified. If we imagine a segment of a circle containing an angle of forty degrees to stand on the line joining two camera stations, it is easily seen that the lines of sight to all points in this segment intersect at a greater angle than forty degrees, and the whole area of the segment is poorly surveyed. This area must be doubled for the two sides of the line. With camera stations distributed over a country at approximately equal distances apart of five miles or so, these unsurveyed segments may become very great, and almost neutralize any attempt at a detailed survey. Had the same total number of stations been placed in pairs, a couple of miles apart, with a much longer interval to the next pair, a very much better survey would result. This is a matter very apt to be overlooked in a photographic survey. It may be remarked that the absence of a record of what has been covered by the photographs taken is much felt in the field. Not only must the surveyor recollect what has been covered, but whether it has been covered twice from suitable stations, a difficult matter in a country whose aspect is much changed as we go from station to station.

The field notes of the photographic part of the survey consists of a record of the number of the plate exposed, the extent of country covered, the time of exposure, kind of light, and such remarks as may be useful. The magnetic bearing of the line of sight of the camera should also be taken by means of a pocket compass, as a general indication of the direction of the view for office reference.

The chief objections to the photographic method may be considered to be the difficulties of obtaining good photographs, the absence of record of what has been properly covered by the camera, the fact that the country must afford stations overlooking large areas, and finally that a long apprenticeship is necessary in the field to properly estimate exposure, and that advancement in the science of photography itself is necessary to perfect the method.

On the other hand, we have a much shorter time in the field, not only saving expense, but a matter of consequence in a severe climate, and a possibility of surveying countries containing many inaccessible points with greater detail than by any other known method. The fact that a rather long time is taken to plot from photographs is largely due to the camera stations not being suitably arranged to facilitate identification, and to

poor qualities of photographs, both of which impediments can only be avoided by practical experience.

As a practical example of the use of the photographic method of survey, some statistics will be given of the survey of the Crows Nest coal area, on which the writer was engaged last year. This area consists of a group of cretaceous mountains 6,500 to 7,500 feet altitude, surrounded by limestone mountains rising to 9,500 feet. The field work in this survey occupied three months with a party of six, all told, during which 51 triangulation stations and 72 camera stations were established and 336 photographs taken. Of the camera stations, 25 were over 7,000 feet and only 14 below 6,000 feet. The area plotted from the photographs covers 551 square miles, an area of over 15 townships. The contours are shown for every 100 feet, and considerable detail is shown, as the plan is on a scale of 1-30,000, or about 38 chains to one inch. The plotting occupied four persons for three months. The altitudes of the triangulation and camera stations were found by trigonometric levelling, using the levels along the Canadian Pacific Railway as a basis. With the exception of a few traverses of some of the rivers the entire topography has been plotted from the photographs. It may fairly be claimed that this large area of rugged country could not have been surveyed and plotted in the same time by any other method. The survey and plotting were carried out under the direction of Mr. A. O. Wheeler, D.L.S., who has been in charge of photographic surveys for the Dominion Government for the past six years.

In the foregoing outline, the writer has endeavored to give some general idea of the photographic method in the survey of mountainous districts, avoiding technicalities which can only be interesting to those who desire to study the method in detail. Such will find in Mr. Deville's work "Photographic Surveying," a complete account of its mathematical aspect and also a masterly review of the principles of photography itself as applied to distant scenery. Another excellent publication is Appendix No. 10, U.S. Coast and Geodetic Survey for 1897, by J. A. Flemer.

DISCUSSION.

Mr. C. A. Jones:—Are those photographs retained by the

Government or by the person who takes them? The Government should have them, or copies of them.

Mr. Dickson:—I understood last year that ten parties had photographic apparatus and that they returned everything to the Department, even the films. Of course when the Government furnishes the apparatus it expects the results will belong to the Government.

[*This Association is not responsible as a body for any opinions expressed in its Papers by Members.*]

THE CANADIAN ASSOCIATION OF CIVIL ENGINEERS AND SURVEYORS.

A. R. DAVIS. B.A.SC., O.L.S.

A few years ago I had the honor of submitting a paper before this Association on the subject, "The Field of Civil Engineering."

At present I desire to glance briefly at the broader field of Civil Engineering and Surveying combined, in order to point out a few reasons why, in my judgment, these two branches of one profession should be consolidated into one Society or Association. We are all pleased with the fact that the tendency of late has been in the direction of a closer fraternal union between Engineers and Surveyors. As members of the Canadian Society of Civil Engineers, and of this Association of Ontario Land Surveyors, the thought presented itself to me that by frankly expressing my views on the subject at the present time, when we are stepping out into a new century, a general friendly discussion of the whole matter might possibly be provoked that would materially assist in bringing our Engineers and Surveyors into closer contact and ultimately lead to a corporate union.

In the first place I think we all realize that in the business world to-day, greater success is being achieved through judicious combinations of brains, as well as of material resources. Men are not disposed to hide their knowledge under a bushel, as in the past; but to diffuse it among their fellow-men. This spirit prevails too, in the professional world, where an individual realizes it is utterly impossible to isolate himself from his professional brethren even for a brief period, and still keep abreast of the times.

The tendency of the times is for each individual to pour his small quota of knowledge,—which is certain to be useful to some one else,—into common public reservoirs. These reservoirs are the periodicals and public meetings of the various departments of business, and the several professions. Then from the accumulated wisdom and knowledge deposited therein are drawn such

portions as each individual may require to meet the exigencies of the case, with which, for the time being, he has to deal.

As we are all aware, the medical profession has recently been engaged in breaking down old barriers of prejudice, widening the field of practice to the limits of the Dominion, and elevating the standard generally by a combination of its forces. The same tendency prevails in all the sister professions, including the one with which we stand identified. Civil Engineering and Surveying are complements the one of the other, not only in practice but in theory as well. Throughout the Dominion the two terms are, almost synonymous, and in fact, interchangeable, to those outside the pale of the profession.

A Civil Engineer in many departments of work is frequently called a Surveyor, although he may never have passed a Surveyor's Examination. The day has passed, however, when the Engineer feels any resentment at being called a Surveyor. He has doubtless found from experience that the modern Surveyor knows something more than how to take a meridian.

A Surveyor on the other hand is called an Engineer, by the public, immediately he ceases to run a side line and to take charge of certain drainage, sewerage, or other work. A railway company sends out a party of Engineers to locate a railway The press in alluding to the fact is quite likely to state that "a party of Surveyors is surveying a railway line from A to B."

Thus we find it in practice. In theory we observe that the several departments of surveying form the most important subject in the curriculum of all the Civil Engineering faculties of our schools and colleges. On the other hand, the several Surveyors' Associations of our Dominion, are more and more recognizing the absolute necessity of compelling aspirants to the profession, to read up and pass examinations on a variety of subjects, which in the past were not regarded as essential in an ordinary Surveyor's practice.

These aspirants are forced to realize that it will be utterly impossible to even eke out an existence to-day as an ordinary old time country Surveyor, let alone to prosper, in his profession Time was when the Surveyors of this country were kept employed the year round in private practice or Government employ They usually owned a good farm, well equipped for work, and were regarded as important members of the community in which they resided. The land trials which then occupied the largest part of the attention of the courts invariably had Surveyors pitted against each other; and thus employment in the courts

was a fruitful source of income. The presence of a Surveyor as a witness in our courts to-day is the exception rather than the rule.

Hence the necessity for our young men who are entering engineering or surveying, qualifying themselves for profitable employment in the larger field of our profession, of which surveying is but a part, and of which engineering as heretofore understood is but one important division.

There is a broad field bounded by the Atlantic and Pacific on the east and west, and by the international boundary and the North Pole on the south and north, in which it should be possible for every duly qualified Canadian Engineer and Surveyor to practice where he pleases, none daring to molest or disturb. Now such a condition of affairs would necessitate a change, in some respects, in the government of the profession, and this is the vital point towards which we are aiming. For instance, in civil engineering, we find the deplorable condition of the laws of the United States rendering it practically impossible for a Canadian Engineer to find employment in that country without renouncing his allegiance to Great Britain, and declaring his intention of becoming an American citizen; while on the other hand our doors are left wide open for an influx of American or other foreign engineers immediately any work is started, promising profitable employment. We have had a glaring illustration of this fact during the last few years in British Columbia and other parts of our western country where there has been active railway construction.

These foreigners are not members of the Canadian Society of Civil Engineers, nor have they the remotest intention of becoming Canadian citizens. I believe in reciprocity; but I am thoroughly opposed to this jug-handled policy, as the politicians would say, and I shall do my utmost in the future to have this injustice remedied. Our Surveyors' Association would not tolerate such a condition of affairs for a moment; and I refer to it here merely to show that the Engineers as well as the Surveyors of this country have important changes to make in their regulations before a corporate union can be effected between the two branches of the profession. With regard to the several divisions of Surveyors, we all realize that a closer bond of union might exist than at present obtains; the absence of which necessitates needless examinations, the payment of additional fees, and a material loss of time. Through the influence of this Ontario Association, and kindred

associations, a more cordial and fraternal feeling prevails than ever before, between our various Surveyors and Engineers' Societies, and between the individual members. This *esprit de corps* has undoubtedly been generated and fostered through the prevailing practice of meeting as at present, on common ground, and in broadly discussing questions that concern our profession in a frank, genial manner. Our selfishness and conceit take wings and fly away in the midst of such surroundings. We learn to value the opinions of others although they may not accord entirely with our own. Thus knowledge is gained; and knowledge is power; and the more powerful we become in this sense the more prosperous and useful we will be in our respective communities. We should not rest satisfied, however, with what has been accomplished. A young generation of Surveyors and Engineers is coming up to take our places. As we look abroad we see changing conditions in this country, now in a transition state from dense forest, poor transportation and undeveloped resources, to broad cultivated areas, rapid transit to the remotest boundaries, and the hum of industry on all sides. One of the important results of these changing conditions, to our profession, is the absolute necessity of the Government immediately taking up the question of a thorough trigonometric or geodetic survey of Canada, in order that accurate maps may be prepared, and the physical features of the country laid down with precision.

It is surprising that our Federal Government and Provincial Legislatures, alive to almost every conceivable question affecting our development and prosperity, should remain fast asleep on this most important question, which is now occupying the keenest attention of the Governments of every progressive country in the world.

If a tithe of the millions of our money now being expended on canals, railway bonuses, and public works, were devoted to the beginning of a geodetic survey of Canada, in keeping with the general progress of the times, more wisdom would be exhibited by our legislators than they are manifesting by closing their eyes to so important a matter. It is most unfortunate that our profession is not more strongly represented on the floor of Parliament, and in our Legislative halls. Had we a few enthusiastic representatives, then our governments would soon realize the necessity of a movement in this direction, as well as in several other directions, in which our profession is more or less interested. Who is ready to

sacrifice himself for so laudable a purpose? A geodetic survey of Canada will create at some time in the near future a great field for the employment of our younger Surveyors and Engineers—a field in which they should meet on common ground, and for which our examinations and legislation should, meantime, pave the way for united, efficient work.

While the geodetic survey is in progress in the southerly or more densely settled portion of the Dominion, other Engineers and Surveyors will be engaged in explorations in the great northerly limits of our country; in the building of colonization roads into newly settled districts and the improvement of those in the older districts; the extension of electric railways through the south country, and the construction of steam railways into the timber, mineral and agricultural areas of the north country; and in the execution of large drainage and sewage problems. The Premier of Ontario in summarizing recently the results of the northern explorations of some of our Surveyors last year, and the known resources of the northerly part of this province, and the intentions of the Government with respect to the development of these resources, gives us a hint or intimation of the work in store for our profession in that heretofore practically unknown district; and Ontario is only a fraction of our great Dominion. Let us then be alive to our opportunities, and frame our legislation now so that it will conserve our best interests in the future. If our Engineers and Surveyors were united into one Society, and jointly attended the Annual Meetings, supplying general papers and discussions and if these proceedings could be placed in the hands of every member of the profession, what a library of useful information on every phase of professional work would be accumulated in the course of a few years.

I am aware such a union appeals more strongly to the younger Engineers and Surveyors than to the older ones; owing perhaps to the fact that the latter, as a rule, have settled down in certain comfortable grooves in professional life, out of which they may not care to move. So far as they personally are concerned the present laws or regulations governing their Association or Society answer very well. Many having acquired a competence have no sympathy with the so-called innovations of the younger members of the profession. It has ever been thus in all the avenues of life; and human nature is slow to change; but still changes are continually being wrought. Therefore I appeal particularly to the younger Surveyors and Engineers to support this

movement for the consolidation and elevation of our profession; for they must bear the burdens and responsibilities of the future.

I see nothing inconsistent in a corporate union of Civil Engineers and Surveyors, and the maintenance if necessary, of certain special examinations for special work, such as, for example, topographical surveying, or hydraulic engineering. The latter are chosen from several branches, simply for the purpose of illustration. I repeat, that there is no good or valid reason for objection to a corporate union on the ground that there would be no surveyors qualified for important special work, or, no Engineers trained to cope with the difficult problems of special branches. These questions would adjust themselves quite readily; and we would have the proud satisfaction of realizing that we have become a common brotherhood, bound together and strengthened by corporate and fraternal bonds for all future time.

I do not assume to know all the difficulties that stand in the way of such a union; nor how best to overcome them. Others, doubtless, will, in due time, give these details careful consideration, and suggest ways and means for its accomplishment. I have merely endeavored to show the tendency of the times toward internal consolidation in the various circles of business and professional life; and to make a few suggestions in favor of a forward step in that direction in our own profession. If what I have said is instrumental in drawing out the opinions of others, and leading to a general discussion of the subject, I shall have fully accomplished my present purpose, and will feel amply rewarded,

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DISCUSSION.

The President:—Gentlemen, Mr. Davis has given us a very valuable paper on an important topic that I have no doubt all of you will take pleasure in discussing. What he says with regard to the qualification of surveyors and engineers is very true. Any young man now who is licensed, or who passes his examination as a surveyor, has passed an examination on many engineering subjects. In fact, he has practically to qualify as a civil engineer in order to become a surveyor. A year or two ago, the

Canadian Society of Civil Engineers proposed to allow all surveyors to become members of the Canadian Society of Civil Engineers for the reason I have just stated.

Mr. Willis Chipman:—Mr. President and Gentlemen: I do not know that I can say anything that would be of interest to you to-night on this important matter; a few years ago I was chairman of a committee having the matter in charge for the Canadian Society, to bring it before our Government; and we met with such a reception that I have not felt very enthusiastic over it since. However, it has been revived again this year by the Canadian Society, and we hope by next year that probably we will be able to report progress.

I, for one, am in favor of uniting the two professions. In this new country of ours we cannot afford to have a number of similar professions or societies where one society is enough. There might be different branches or different departments in the one society, as is suggested by Mr. Davis; I hope that the amalgamation of the two societies will be consummated in my day.

Mr. Villiers Sankey:—I thought I had a letter here that would partly answer one of the remarks which Mr. Davis has just made, but I am sorry to say I have not the letter with me; but I can recall the substance of it; and Mr. Van Nostrand can give us the answer that was sent to the letter I refer to.

This letter was from a gentleman in Winnipeg, who suggested that there were a great many examinations, and a great many fees to be paid by surveyors in the Dominion of Canada, and he thought that it would be advisable for us to meet on some intermediate ground, probably not a very high plane, that would be common to all the Provinces of the Dominion, as well as to the Dominion Land Surveyors. His idea was that a man having passed his preliminary examination, and having served a reasonable apprenticeship, should then be permitted to pass a final examination, which would qualify him as a competent surveyor in all the Provinces of Canada. In other words, make us all what the public thinks we are, Dominion Land Surveyors. I have been met with the question, "You are a Dominion Land Surveyor?" and when I have said "Yes," I have then been asked, "Then you can survey from the Atlantic to the Pacific?" My answer to that rather astonished my questioner, when I said, "I cannot." As a matter of fact, the amount of ground a Dominion Land Surveyor has a right to survey is rather re-

stricted; years ago, he could survey in Manitoba, but now he cannot. A Dominion Land Surveyor cannot survey in Ontario or in any of the Provinces. A letter on this question came to Mr. Van Nostrand before I became Secretary of the Association, and he answered it, in the only way he could answer it, showing that down in the Eastern Provinces the qualification for Provincial Land Surveyors is not at all comparable to what it is in Ontario, in Quebec or in Manitoba. Some years ago we were rather astonished to find that the Board of Dominion Land Surveyors would not recognize Ontario Land Surveyors at all; and at a recent examination in Ottawa they asked Ontario Land Surveyors to pass the whole examination.

While speaking of Examiners I am able to say on behalf of the Ontario Land Surveyors that ours is the broadest and the most open-minded Board of Examiners that there is in Canada to-day; under our recent Legislation it rests with the Board of Examiners to say whether the candidate will be required to pass the whole of our examination or part of it, and how much service he will be asked to undergo. We are not bound by any hard and fast rules or by any reciprocity with any other association either Provincial or Dominion. I do not think, to-day, even if the Dominion Board asked our members to pass the whole of their examination, that we would necessarily turn round and ask a Dominion Land Surveyor, to pass the whole of our examination. If we know the class of examination their members have passed and are satisfied with it, we are perfectly free to say, "That is good enough for Ontario!" And I do not think that the Surveyors of the Dominion can really say that we are behind other Surveyors in any point. The difficulty the Surveyors in the whole of the Dominion have in order to meet on a common plane is that some of the others are not quite up to our standard. I think, however, with proper representation, that any difficulties as to the preliminary examination and time of service could be easily over-come.

Speaking on the question of reciprocity with the Engineers, as Mr. Chipman and some others present know, we discussed that about two years ago; and as far as I was able to judge, the feeling of our Association was that if we could meet on a satisfactory plane we were quite willing to give the right hand of fellowship to every Engineer in the Dominion of Canada. The question was, what position were the Ontario Land Surveyors going to occupy in the event of amalgamation. After a great deal of discussion a mutual basis was established, and

I believe the Ontario Land Surveyors did all they could to help the Engineers to get their Bill through the Ontario House. But until the Engineers of Ontario get some status, some recognized position, an amalgamation will be difficult. If they can get their position officially recognized, I think the amalgamation would follow almost at once. The trouble seemed to me to be that the Engineers themselves were not united. They have to meet a great many difficult questions. There are all sorts of Engineers—I am not saying that in any way slightingly, but I suppose engineering, like everything else, has in its ranks a number of specialists. Possibly it may be said that some of these gentlemen are Engineers and others are not; but in the event of amalgamation the Ontario Land Surveyors cannot leave any one out if there is any possible way of bringing all together. In engineering we find the Mechanical Engineer, the Railroad Engineer and the Municipal Engineer; and I am glad to say that our Association of Ontario Land Surveyors embraces some representatives of almost all these classes in Ontario. The City Engineers of almost every City of Ontario and the chief Engineers of such Railway Companies as The Canadian Pacific, The Grand Trunk, The Central Ontario and others I might mention are all regular members of this Association.

I think the paper we have just heard read points in the right direction; and we ought to nominate a special committee to try to further the objects brought before us. We are in a position now to do so, having an Association of some years standing, and having some little weight in the community. We have experience in the matter of getting incorporation; and it certainly would not hurt the movement if we were in a position to say, "We have a committee ready to meet you and ready to discuss the whole question."

I hope to hear some other members express their views; I know Mr. VanNostrand has some excellent ideas on the question of amalgamation with the other Surveyors of the Dominion. We need not be afraid of expressing our opinions here for while there are a good many Surveyors and a good many Engineers in the room, we are all here to-day as Ontario Land Surveyors, and the fact that this is a meeting of Ontario Land Surveyors ought not to hinder an Engineer who has strong views from expressing those views. We are not going to take advantage of any remarks that may be made here. As a Surveyor pure and simple I would say the sooner the amalgamation

of Surveyors takes place the better for the Association and the better for the whole profession; and, I believe also, for the public at large.

As Secretary of the Association probably I should not have taken up so much time, but I am afraid some of our members are a little bit shy so I wanted to start the ball rolling. (Applause).

Mr. A. J. VanNostrand (Toronto).—Mr. President: Some years ago I somehow got hold of the idea that it seemed rather foolish to ask a man who had taken the Dominion Topographical Certificate to come here and wade through the "Pons Asinorum" and a few more such things, and I opened a correspondence with the Secretaries of the various Provincial Boards, with a view to arriving at some sort of arrangement under which a man might pass an examination in the elementary subjects at least, before any one Board, and by reason of that examination be admitted by any other Board in the circle. The thing went along very well until I reached British Columbia; and there I got a private hint that their door was wider open than ours was; that, under their Statute, Engineers of various kinds were admitted on short terms of service; in fact persons were permitted to enter the profession of Land Surveying in British Columbia on much easier terms than those required by any other Board! As the Engineers did not seem to be in a position to offer any *quid pro quo* it seemed to me that it was about time to give up my idea and I did so. It still seems to me, however, that theoretically speaking it is not the part of wisdom to require each man to go over the same ground again if he happens to wish to take out certificates from the various Boards, Provincial and Dominion. Such, however, is the position to-day. And until the Engineers arrive at some stated form of examination I do not see how we, Land Surveyors, even supposing all Dominion and Provincial Land Surveyors had amalgamated, could come into association with them.

The Maritime Provinces, however, do not appear to have a standard in any way similar to our own for admission to the profession of Land Surveyor. So far as I can learn, a Land Surveyor there is a good practical man who is about as far advanced as a good timber estimater is here; a man with a little mathematical knowledge, and a little practical knowledge of surveying. And until their standard has been brought nearer to ours it does not seem to me to be a wise thing to amalgamate with those Provinces. As the writer of the paper suggested, all

things are trending towards union because the various Provinces are uniting and the professions of Engineer and Surveyor are kindred to such an extent that they are carried on by the same parties in many instances, and therefore, we ought to make some move. It would be a very good idea to have a committee appointed because if something is to be done this is a very good time to make a commencement. (Applause).

Mr. G. B. Kirkpatrick (Toronto):—Mr. President and gentlemen: When Mr. VanNostrand was speaking I thought of an old story told of the American War, where the standard-bearer planted his standard on top of a hill and in front of his men who called out to him, "Come down! Bring the standard down!" His reply was, "Never! Bring the men up to the standard." I do not think we should come down to a lower level than our own. (Hear, hear). We have been for years bringing our standard up; and we must keep it there. I say, just as that standard-bearer said, Bring your men up to our standard and then there will be no difficulty. I am quite in accord with the idea that it is nonsensical to make Surveyors pass the same examination over again. On that point I think our Board has taken the proper stand, that is, to keep the door open, without lowering our standards and to recognize that we are not the "whole bunch," to speak vulgarly. We have a standard which is second to none, but we are not going to humiliate men who have passed a first class examination in mathematical subjects, by asking them to go in again for a similar examination; we are quite satisfied, if they can present their certificates, to give them the examination. We must, of course ask them what their term of service has been, so that they should not militate against our own men as regards service.. We leave them free to take up the higher subjects which we have in our profession the curriculum for which, as you know, has been extended until it embraces almost everything that an ordinary Engineer has to pass.

There are specialists in the different branches of Engineering who occupy positions which it is impossible for the ordinary Engineers to attain to. The Engineers and the Surveyors who have passed within the last ten or fifteen years, are quite able to cope with the majority of engineering or surveying problems which arise in Canada to-day. Mention has been made here to-night of the chief Engineers of different Railway Companies; and as to those gentlemen let me say that they are nearly all self-made men; they did not attend College, they

did not pass examinations, but they had a broad knowledge of what the best Ontario Land Surveyors require and they had good common sense. They did not get into a rut. They studied their profession and they gradually rose by the force of their education and their abilities to be the head men in their respective Companies to-day.

As an example, I remember Mr. Hobson when he was an Ontario Land Surveyor—he is one still; when he was second engineer on construction on the Grand Trunk, on the next section to which I had the honor of being rod-man. Mr. Hobson was then a tolerably young man, and I do not suppose he had studied engineering very much; yet he has solved a problem which I suppose would be an example to the most highly educated. He was the Engineer of the St. Clair Tunnel at Sarnia. I remember when the two borings, one from each side of the River met, that there was not two inches of difference; that was pretty good engineering. There is no reason in the world why all our Surveyors should not work together for the benefit of our profession: and if having amalgamation between the Engineers and Surveyors is going to raise the profession I do not think the Engineers when they are ready for it, will find the Association of Land Surveyors are backward in joining them. When this matter was up before, I remember we made a very good advance; there was a deputation, amongst the members of which I remember Colonel Gzowski and Allan MacDougall, and some other Engineers, and we met them and discussed the subject, and there was no opposition on our part; there never has been. Our desire always was, not to be dragged down and put on a lower level than we stand on to-day. If the Engineers become incorporated, and then approach us in as friendly a spirit as they did before, I see no reason why we should not have amalgamation. (Applause).

President Ross:—I understand the proposition made two years ago by the Civil Engineers was that all Surveyors were entitled to become Civil Engineers; but there was no proposition to make all Engineers Ontario Land Surveyors. Is that correct ?

Mr. Sankey:—Yes.

President Ross:—Of course that was very favorable to the Land Surveyors, and very considerate of the Engineers.

Mr. Sankey:—I think you are stating it a little wrongly. It was, All Surveyors at the time of incorporation; not, All future Surveyors.

President Ross:—Yes, I understand that. With regard to the Ontario Land Surveyors becoming Dominion Land Surveyors, I was not aware that it was necessary for an Ontario Land Surveyor to pass the full examination. Of course it was some years ago when I qualified.

Mr. Sankey:—All I can say in answer to that about a week ago several members of our Association went down and passed their examination; and they were required to pass in everything.

Mr. VanNostrand:—Including certain preliminary examinations too.

Mr. Sankey:—They went through the whole academical and theoretical examination as if they were not Surveyors.

President Ross:—That was not required some years ago.

Mr. Sankey:—No.

With regard to Manitoba, they have the reciprocity clause in their Act which provides that they will reciprocate with any other Provincial Association and not require examination in anything but the special Manitoba Land Acts, as I might put it. That is, if the Association from which the Surveyor seeking admission will reciprocate with them. The question has been asked me, and the answer I have had to give is, We have no reciprocity now at all; but if the Manitoba examination is in the opinion of the Examiners sufficiently similar to ours we will not examine at all except on the Ontario Survey of Lands and Drainage Acts; and if their term of service is sufficient we would not ask them service. That seems to be the position we are in to-day. But we could not write to a man and say, We will reciprocate with Manitoba if Manitoba reciprocates with us. If the examination is good enough in Manitoba, reciprocity or no reciprocity, Ontario should say, Your examination is good enough for us; pass the special subjects and we will give you a certificate. Reciprocity does not amount to anything; it is merely a motion of the Board of Examiners for the time being. The Dominion Board a little while ago—(I do not know what happened them)—simply wrote and stated they would not recognize Ontario Land Surveyors in any way; and now they examine our men in everything. Are we going to say to the Dominion if their men come up here, We are going to examine you in everything? I hope not. We know their Examiners are clever men and that they put their candidates through a stiff examination. Then why should we say because

you examine our men, we will examine yours. If we are satisfied with the man's standing it is better not to examine him at all; it costs the Association something every time we examine a man, and it is better to get good men without examination, except in subjects which are absolutely necessary.

H. J. Bowman (Berlin):—My first impression, formed some years ago, was that the Association of Ontario Land Surveyors had the ground work for a combined society of Surveyors and Civil Engineers, and that with a few slight additions to our present legislation we could make room for those that were purely engineers, and had no knowledge of the laws regulating the surveying of lands. And I still think that such would have been a much easier method to pursue than the one that has been followed; for we find that the Canadian Society of Civil Engineers met with considerable difficulty and in fact were not able to carry through the Bill they introduced. However, they are seeking fresh legislation, and, judging from what Mr. Chipman says, they will bring up their Bill again shortly, and we must meet the conditions as they are. My recollection of the Bill as finally amended is that it was in such a shape that it would be acceptable to the Land Surveyors; that there was nothing interfering with the interests of those who have applied themselves more particularly to land surveying and who do not take up civil engineering to any great extent. There seemed to have been two opposing tendencies; those Engineers who thought they were above the Land Surveyors, and those Land Surveyors who were content with their present position and did not wish to endanger the status of our present Association; but it seems to me a course can be pursued where the interests of all may be conserved.

I had hoped that Mr. Chipman would have outlined a little more fully the Bill they are going to bring in shortly. He could not have got a more propitious time to present it to this Association, seeing that it has been proposed to-night by our President, our Secretary and different members here to form a Committee, before the Engineers asked us to work in co-operation with them. This is a move in the right direction.

The engineering profession in Ontario is not in as desirable a position as it should be; we find that public money is being spent in some of the large towns, and in the smaller towns and villages of course, very inadvisedly; large amounts are being spent for what should be permanent improvements but these are executed without any engineering supervision what-

ever. Some practical man who thinks he knows all about it has charge of the work and in a couple of years afterwards the municipality find how little that man really did know, and how ill-fitted he was for his position. It is a very easy matter to design a public work to please the people for the day; but to form any opinion as to what the condition of the work may be fifty years hence is a different matter. My observation has led me to believe that a great deal of the money of the municipalities is being thrown away, and the work will have to be all done over again in a few years, just because of want of proper legislation to protect the public from this waste of their money by bringing up a class of Engineers who are not only competent to do the work, but who will get the work, and who will not be underbid by those who have a political pull, or a pull in the local municipal affairs. (Applause).

Mr. Sankey:—Certain members of the Engineering Profession in Ontario objected very strongly to the Engineers' Bill going through. But in the Province of Ontario at large, outside of professional boundaries there seems to be a growing feeling against what are called "close corporations;" and I suppose the Ontario Land Surveyors are sometimes called a close corporation. But any corporation that tries to give the public a good professional man is not a close corporation. Nevertheless the difficulty that the Engineers, or those of any other profession, are going to meet with before the Local House here is the cry of "close corporation;" and until the bodies asking for incorporation show a united front with the Government they are opening the door through which the Government will get out. Want of unity was really what killed the Engineers' Bill. The Legislature of Ontario to-day does not want to run the risk of being told that they are creating a lot of close corporations all over this Province. They will say, "You are not representing this before us in the interests of the whole of your profession." If the Engineers could come together and present a bill before the House that can be supported by every branch of the Engineering Profession I am perfectly sure the Ontario Land Surveyors, who, as a body have possibly some little weight in the Local House, will put their shoulders to and help them to get their Bill through the House.

Mr. Bowman also spoke about the spending of public moneys. It is perfectly true there must be an enormous amount of public money spent in Ontario to-day that is wasted, thrown

away; and unfortunately the Engineering Profession as a body gets the blame, simply because the public does not discriminate between what Mr. Bowman called the ordinary practical man, and the engineer; and the public says, "Oh, an Engineer did that;" and so the Engineering body as a whole gets a bad name.

Mr. Aylesworth:—Mr. President: There are one or two words in Mr. Davis' paper I would like to have eliminated. The writer speaks of money being "squandered on canals and railways." I would suggest that the paper be changed to read "A large amount of money expended." With that change I would move that this paper be received and the thanks of the Association be given to Mr. Davis for it.

Captain Gamble:—I have much pleasure in seconding that motion.

The President put the motion, and, on a vote having been taken, declared it carried.

This Association is not responsible as a body for the opinions expressed in its Papers by Authors.]

SURVEYS FOR MUNICIPALITIES.

BY H. J. BOWMAN, OF BERLIN.

[The following is a summary of the Paper as read by Mr. Bowman, the MSS. having gone astray.]

Those sections relating to municipal surveys form an important part of "The Surveys Act." Particular attention is directed to sections 10 to 13 of the act, relating to boundary lines of townships, and to section 14. In 1897 an important addition was made to this section as follows: (4) On the return of such survey to the Commissioner of Crown Lands he shall cause a notice thereof to be advertised once in each week for four weeks in some newspaper published in the county town of the county in which the lands lie, and shall specify in the advertisement a day not less than ten days from the last publication on which the report of the survey will be considered, and parties affected thereby heard, and on the hearing the commissioner may either confirm the survey or direct such amendments or correction to be made as shall seem just, and shall confirm the survey so amended or corrected, and the lines or parts of the lines so surveyed and marked as aforesaid, shall thereafter be the permanent boundary lines of such concessions or side roads or part of concessions or side roads to all intents and purposes of law whatsoever, and the order of the said commissioner confirming the said survey shall be final, and conclusive upon all parties; and shall not be questioned in any court whatsoever; 60 Vic., Chap. 27, Sec. 14.

Previous to this amendment to the act these municipal surveys had much the same standing as surveys for private individuals, but now, no doubt there will be applications for many more.

Section 15 deals for the first time with angles of lots, and all surveys under this section are to be confirmed in the manner provided in the previous section. The foregoing refers to those portions of "The Surveys Act," known as "Municipal" surveys. It is evident that these sections of the

act apply only where the original survey was made by the Crown, and there is no question but that they will be in the interest of the people at large. Many towns and villages in this province were laid out for private individuals many years ago, and now the street lines are in many cases obliterated. Some means should be provided so that the councils of all municipalities may have resurveys made; also in many towns permanent cement walks and other street improvements are being made without having the street lines properly defined. . The writer would suggest that in all cases the application of the municipal council be to the County Judge who would appoint an Ontario land surveyor to do the work. On the return of the survey the County Judge should cause a notice to be advertised in some newspaper, and specify the day when the report of the survey will be considered, and the parties affected thereby heard, after which the survey, being amended if necessary, would be confirmed. In 1897 an important amendment was made to this section, so that now surveyors must follow the method adopted in making the original survey as shown on the plan of same. This would be filed in the Registry Office, and could easily be produced at the County Judge's chambers should it be necessary when a survey is being confirmed.

DISCUSSION.

Mr. H. J. Bowman:—This opens up a field for discussion; and as I see the next order on the programme is a discussion, I hope the members will state briefly what they think about this proposition for putting our surveys on a little better footing.

Mr. Dickson:—I think the idea of having monuments planted at the corners of streets and so on is a capital one. You have all no doubt had practice in village and town surveys. I know in my town the first thing I have to do is to establish the intersection of streets, and in many places there has only been a bit of a post, perhaps two inches square, put down and no lot number on it; such posts last only for two or three years, and then they are gone. I think it should be compulsory for the municipalities and the owners of land to plant permanent monuments in new surveys, and also for municipalities, towns and villages, to put an iron post of about an inch and a half or two inches in diameter, say, three feet long, at the intersection of streets already laid

out, leaving six inches or a foot above the ground, with the name of the street stamped on the side next to the street, and the number of the lot on the other side. They do so in Manitoba.

Mr. Sewell:—I think while discussing this subject it would be well if our Committee on Legislation would look into the wording of those municipal sections under which we work. I am speaking from personal experience. I know that the sections only call for a very limited amount, now, for instance, if you wanted to lay out a block of two or three Concessions, where the posts were pretty nearly lost, you cannot do it under the Municipal Act, it is not provided for. You can run along one concession, but you cannot turn round the corner and go down, that is prohibited; if you do, the Surveyor is going to be left in the lurch, as I was on one occasion, to the tune of about $200.

President Ross:—Did you carry out your instructions ?

Mr. Sewell:—I carried out my instructions from the Crown Lands Department. It was in the Township of Papoonge, where I surveyed a large block; I got $500 from the Crown Lands Department, and the rest I was to get from the Municipality. I found out afterwards that the whole transaction was illegal.

President Ross:—The parties who gave you the order were responsible.

Mr. Sewell:—But it couldn't be assessed. There was no law for assessing it—it couldn't legally have been assessed. There is a clause in that Act that provides for the assessment for the payment.

Mr. Aylesworth:—In the early part of the paper the writer says there is no machinery for confirming municipal surveys.

Mr. H. J. Bowman:—Made for a County Council.

Mr. Aylesworth:—The instruction comes from the Commissioner of Crown Lands; and the report is made to his Department, and the survey is approved by him, and payment made to the Surveyor; isn't that a confirmation of it ?

Mr. H. J. Bowman:—There is no method given in the Act for confirming surveys made for County Councils; but there is a method laid down for confirming those made for Township Councils.

Mr. Aylesworth:—Bench marks may be put down, but before that is done instructions have to come from the court, and the report should be made to the Crown Lands Department. When

that report is made, and approved, and payment made, is not the survey confirmed as to the courses and distances and so-forth ?

Mr. H. J. Bowman:—I wish we had some of our standbys—Mr. Gibson or Mr. Kirkpatrick—here in discussing the Act, but I think every member knows until this amendment of 1897 there was nothing in the Act that prevented municipal surveys of any kind from being reviewed by the courts, and, if there was any later evidence, the whole thing could be set aside. In 1897 a subsection was added:—

Mr. Aylesworth:—But it did not cover the former sections.

Mr. H. J. Bowman:—A subsection was added to section 14 which deals with surveys for Township Councils; and I think it is very plain now that the courts hold no jurisdiction to take up and set aside a survey of that kind. The subsection says it shall not be questioned in any court whatever. Now, the intention of the Legislature is that those surveys made by the instructions of the Commissioner of the Crown shall be final, even should there be some evidence later on to show that there might be a difference of opinion. But that method of confirmation is not attached to the previous clauses where surveys of boundaries have been made. It does not apply to them. If it is a good thing why should it not be made to apply to those. I do not suppose there are many surveys of that kind made, but there might be.—

Mr. Aylesworth:—Some years ago I remember a case of a survey in the Township of Hinchinbrook and the Surveyor making his verification failed to get some original posts, afterwards I found those posts, got evidence, went into court and upset his survey altogether as far as those lots were concerned.

Mr. H. J. Bowman:—By advertising in the newspapers opportunity would be given to the parties interested or who owned the lots to come forward with their evidence; and if they did not appear either personally or by counsel before the Commissioner of Crown Lands the survey would then be final and would be confirmed, and later evidence would not be received and so they would be the losers. It has to be advertised in the County Town. Some county towns have not a newspaper—at least one county town. This might occasion a difficulty such as that experienced by my friend Mr. Sewell; and when the Act is being revised again, as it is periodically, it might be amended to read, the County Town or some other town in the County.

Mr. Aylesworth:—The paper is a valuable one and I move

it be received and adopted and printed; I would like to have it referred to the Committee on Legislation so that they might take up the suggestions and if possible have them carried out.

Mr. H. H. Gibson:—Is it the intention of this paper to make it compulsory to have surveys made or make a similar survey as provided for township surveys ?

Mr. H. J. Bowman:—Now, the Act only applies to surveys made for the Crown or those that have the same effect—original surveys. We know, for instance on the line of the Grand Trunk West, that towns were laid out at the time the railway was building and large subdivisions of three or four hundred acres were made, and at present there is no way by which a re-survey can be made at the expense of a Municipal Council, and monuments planted, and an advertisement put in the newspaper, and people given an opportunity to come forward and bring in evidence; there is no means of doing so in these towns. The Act simply applies to those towns where the original survey was made for the Crown, or for the Canada Company, or for some other company or individual that had the grant direct from the Crown of a large tract. There is no way of having an ordinary subdivision resurveyed and put in such shape that the matter will not be questioned by the courts.

Mr. Sewell:—The only way to do it is to file the affidavits.

Mr. H. J. Bowman:—That does not do any good; the matter can be brought up in court again. To make a particular case, in my town (Berlin) there was a large survey made of some three or four or five hundred acres along the Grand Trunk; this survey was made at the time the Grand Trunk was built, and there were no stone monuments planted in that survey; it was made fifty years ago, and now, the old fences are gradually disappearing. There are no cows running at large in the town, so that people do not feel like putting up fences in every case, because fences cost quite a bit of money, and they are rather unsightly sometimes, so that as the fences decay they simply have them removed and have the fence line marked perhaps by some little cedar hedge or something of that kind—or perhaps not at all. You will find very few places on that survey where the street lines can be got at by any monuments whatever. There was a case in court recently, held before the County Judge, and he dismissed the action because there was no evidence to show where the street line was. The action was a matter of trespass; and the Judge said, "You could not prove where the line was." As time goes on

this will become worse. If a survey were now made at the expense of the municipality to put stone monuments at the intersections of the streets, some evidence can still be had. The old residences and the old fences, if left standing, are mute evidence of the approximate location of the street lines, and a resurvey could be made and advertised; and that would be much better than if the matter were deferred to later on. I think the Act ought to be extended to apply to all the municipalities; it is a good thing to apply it to all.

Mr. H. H. Gibson:—I quite agree with Mr. Bowman on this subject, that this law should be extended to villages and towns, and even cities, for we meet with a great many difficulties in locating the angles of streets and lots, and in many cases it would be impossible to locate the original ones. I have a good deal of this work to do myself. At the present time I am making plans for two villages; I have been making them for three years. I am always guided by the Registrar's wish to hurry the matter or let it stand; and in the present case he did not want me to hurry it. In one of these villages boundaries are very easily located—in the other one, which was a very old village, it was almost impossible to find the boundaries at all along certain streets; it was built on a marsh, with a main road up through the village, where they had laid the logs over the swamp, leading to the mills; and I had to establish that road as well as I could, to put it on my plan.

The Registrar in the north part of the County of York has adopted rather a peculiar method in reference to registering plans of villages; he wishes me to show upon this plan any lots that are not shown on the registered plan, and give those lots special numbers, commencing at No. 1, and going up as high as they run—there would be perhaps 150 lots on the total plan; and he registers these lots the same as an ordinary registered plan; and any deeds registered after that, have to refer to that plan, as No. so and so, and the plan has the same authority as a registered plan by an individual, in his opinion. I would like to hear some opinions on this matter, if it does not interfere with the discussion on Mr. Bowman's paper.

President Ross:—In Welland County the Registrar requires all lots not laid down on a registered plan to be designated by some letter or number; and they have all to be designated by that letter or number in every transfer afterwards; and he claims that he does that with the approval of the Inspector of Registry Offices. Of course unless lots are so designated, the value of a compiled plan is not nearly so great as it should be.

With regard to the setting of stone monuments, there is no authority now. When a Surveyor undertakes to make a corporation plan, if he indicates the angles of the corporation, he thinks he is doing a very good thing, but in a great many towns and villages they do not know even where the angles of their corporation are. After a time they forget even when they were incorporated, or by what authority they became incorporated, and forget where their actual boundaries are. Heavy substantial stone monuments could not be easily removed or thrown away, and they should be set at the intersection of important streets or roads in all municipalities.

Mr. H. H. Gibson:—Where would you place these monuments ?

President Ross:—In a convenient place, indicating their position by offsets which could be shown on the plan. Every difficulty as to position could be easily overcome.

Mr. H. H. Gibson:—It is impossible to put them at the corner of the lot in many cases, for instance where there are large buildings.

President Ross:—A Surveyor going out to make a survey in many places may spend much time, and though he may make a correct survey, if he goes into court, it would be hard to prove that his work is correct, because so many things have of necessity to be supposed, and most surveys that are made become matters of evidence. While you might call it a legal survey in one way, it would be impossible to say that it is actually correct according to the original surveys, or monuments planted in the original surveys. If advantage were taken of this Act, there is no doubt it would be a very good thing for the people, and probably for the Surveyors too.

Mr. Davis:—I had some experience a few years ago on the first question Mr. Gibson raised; I was called upon to make a resurvey of five villages in one township; and the plans I made were filed in the Registry Office, and I believe they have superseded the old plans largely. The lots were all renumbered; letters were used for the blocks, and figures for the numbers of the lots. I think there was a great weakness however in the survey, from the fact that no monuments were planted, and the lot corners are not established any more to-day than they were before that survey, and trouble may arise in the future, just as in the past, in reference to the subdivisions. In fact, I have since been called upon to locate a special lot in one of those villages, and in order

to locate it definitely, one of the old residents was brought forth who knew of a place between the lots, on the borders of the road, where Mr. A. B. Pary, many years ago, planted a post; and we spent a forenoon in digging all along that street, and finally found this cedar post which no doubt established that corner; and our survey was made accordingly. I fully concur with Mr. Bowman in his ideas regarding this subject. Where these surveys are made, whether Township boundaries or Concession boundaries, or town lot boundaries, a stone monument or an iron monument of some kind should be planted. With regard to the buildings standing in the way of a corner in a town or city, the plan adopted in Winnipeg, that I noticed on the general plan there of the city, and which perhaps is adopted here and elsewhere, of laying down a line at a certain number of feet, say six or ten feet, from the corner of the block upon which all those iron monuments have been planted, and stamped as suggested by Mr. Dickson, would be useful. While it is not the actual corner, it designates the corner as being a certain number of feet in from this established line, so that it becomes an easy matter at any time in that city to locate any corner of a block.

Mr. Dickson:—Is that the case in all streets, or only where buildings are in the way ?

Mr. Davis:—I believe that prevails all through the City of Winnipeg; a red line is laid down on the plan parallel with the road and six or ten feet from the corner.

President Ross:—The City Surveyor's plan.

Mr. Davis:—Yes.

The President:—It would have no legal standing; it would be only a private reference. . . .

Mr. Davis:—I do not suppose it would have any legal standing; but there is no reason why it could not have authority in all the plans that are registered.

Mr. Arthur Harvey:—Mr. President, I beg to present you with a couple of pamphlets bearing on the metric system, which is a subject I have been led to take some interest in lately, and I thought it would be a matter for discussion at this Convention.

President Ross:—Thank you. We had a slight discussion on that subject a few minutes ago; we are very pleased to get the information. Have you anything further to offer the meeting ?

Mr. Harvey:—I have nothing to offer. I will be glad if the

Society will express its opinion as to the matters to which I have alluded in the communications I have given you.

Mr. Warren:—I think Mr. Bowman's paper is very interesting, and a very important paper. Those of us especially who have been long in practice would know these corners and places, where perhaps some of our younger Surveyors would not. I know in villages in the County of Halton it has been in some cases very difficult to locate these points; but if stone monuments or permanent monuments had been placed years ago, they could have been much more readily established and found; I know in the Village of Georgetown a stone had been planted by Mr. Joseph Black, an old Surveyor, as marking an important corner of a street, but the owner built a stone house at the corner, and instead of leaving that stone monument, or putting a permanent one, he carefully carried away the stone, and he has it upstairs in his house so that it can be looked at there. I was looking for that stone in making a survey; and he told me that he had it upstairs in his house. It might as well have been in Botany Bay. I think we should ask that the suggestions in this paper be enforced now, while many of these places could be established that possibly we may not be able to establish later on. I know cases in Georgetown, and in other villages in the County of Halton, of posts being found by digging down in the neighborhood where either a fence post or the corner post of the lot had been. Another difficulty arises from the fact that the Surveyors' chains were not tested to the millionth part of an inch, as they are in the Standard now, for sometimes the chain was a link long; I know in that county, taking all the lots, the chain must have been fully a link long, because every lot measures about thirty chains and thirty links. It is very difficult now to make up a division of lots by actual measurement. The Surveyor might have surveyed one part of the village, and his chain was so and so, and the longer he went, the longer his chain went. It should not only be in towns, but in villages, cities and townships that the corners ought to be established permanently. In many of the newer townships those corners can be established, but in the older ones it would be almost impossible to do it, except by the old fence posts, and they cannot always be found. I approve very much of the paper, and I hope it may be acted on.

Mr. Sewell:—Sometimes in measuring over the same piece of ground with the same tape, I have found the distance between these posts considerably shortened when the ground was cleaned.

President Ross:—It makes a difference who measures it, and what state the ground is in

Mr. Sewell:—Where I measured myself over the same ground, I found a difference after the ground had been cleaned up, from what it was in the bush.

Mr. Bowman:—One remark, before closing. There seems to be an opinion on the part of some of the members that there should be legislation compelling the municipalities to have particular lines defined. I think we ought to go rather slow in that direction, and that the first thing is to get machinery by which they may have their street intersections defined. I think it would be a very good idea to have this matter referred to the Legislation Committee, and then we might get legislation that would make it possible to have it completed. The matter might be brought to the attention of Municipal Councils. A circular might be issued by the Association.

President Ross:—This Committee might take steps—

Mr. Bowman:—Yes; pointing out to the Municipal Councils the desirability and economy of having it done now, of having their street intersections marked by planting monuments, and having a small appropriation made in their estimates for doing so, because a dollar spent now will save ten dollars or more to their rate payers later on. I think if we brought the matter to their attention that a good many municipalities would have it done. We should not try to force them to have it done; we need not do that.

President Ross:—We cannot do it.

Mr. Dickson:—I think it would be well to have it compulsory on any person sub-dividing lands in the future to have the corners and intersections of streets so identified. An iron post an inch and a half or two inches in diameter will cost very little.

President Ross:—An iron post could be taken up and thrown away.

Mr. Dickson:—Yes, or a stone could be thrown away; but it would cost much more and be harder to plant.

Mr. H. H. Gibson:—Around Toronto they use our wooden stakes for kindling-wood; as fast as you plant them they are taken up and used.

President Ross:—I suppose you do not usually plant anything, but make a plan.

Mr. H. H. Gibson:—We make the plan.

PAPERS USED AT THE FEBRUARY SESSION OF THE BOARD OF EXAMINERS, 1901.

PRELIMINARY EXAMINATION.

Subjects Nos. 1 and 2.

PENMANSHIP AND GRAMMAR.

1. What is grammar? What is a sentence? Into what parts are sentences divided, and how are they classified? Give examples of each, and divide them.

2. Define inflection, and give examples explaining them.

3. What are pronouns? How many classes are there? Give examples and explain.

4. What part of a sentence depends on the verb? How many moods are there? Classify the tenses. Give examples.

5. Fill in the blanks in the following:

I did that lest he ——— suspect my object.

He promised that it ——— not occur again.

Distinguish the following: You will (shall) have another chance.

If that was (were) the case, what ought I to do?

6. Explain generally the rules of punctuation, and when should capital letters be used?

PENMANSHIP.

Write neatly and carefully letters on the following subjects, giving proper headings and endings:

To the Commissioner of Crown Lands for Ontario, asking for information as to how an application for a mining grant is to be made.

To a sister, giving an account of your visit to a town.

ARITHMETIC.

Subject No. 3.

1. Express the following as mixed or whole numbers,

$$\frac{231750}{153} \qquad \frac{14264}{239} \qquad \frac{25713}{1168}$$

Reduce the following to improper fractions.

$$26\ \tfrac{201}{202}, \quad 164\ \tfrac{118}{441}, \quad 157\ \tfrac{122}{187}$$

2. Reduce to decimals:

$$\tfrac{1}{2} + \tfrac{1}{5} - \tfrac{1}{8}; \quad \frac{47\ \frac{5}{8}}{94} \text{ of } \frac{11\ \frac{3}{4}}{7.5}$$

Reduce to circulating decimals:

$$\tfrac{3231}{3520}, \quad 7\ \tfrac{962}{3367}, \quad \tfrac{17}{99000}$$

Find the vulgar fractions equivalent to the following,

$$.00\dot{1}8\dot{5}, \quad 3.\dot{0}2\dot{4}, \quad .01236\dot{}$$

Give the rule for the latter and explain it.

3. If a man walk 62 miles in 3 days, in how many will he walk 80 miles ?

How many men must be employed to finish a piece of work in 15 days, which 5 men can do in 24 days ?

A church clock is set at 12 on Saturday night, at noon on Tuesday it is 3 minutes fast. What will be the time when the clock strikes 4 on Thursday afternoon ?

4. Define square and cube root. Extract the square roots of

$$98596, \quad 37249, \quad 11664$$

$$\tfrac{3}{5}, \quad \tfrac{1}{17}, \quad 2\tfrac{1}{2}, \quad \frac{3\frac{1}{2}}{4\frac{1}{2}} \text{ to 4 Places.}$$

Find the cube roots of 54872, 110592,, 300763.

5. Three townships have to raise among them $7,450, each in proportion to its assessment, which is $1,745,680; $2,385,000, and $4,763,540; find to the nearest cent the proportions ?

6. If a cubic foot of water equal 25 quarts, how many gallons will pass under a bridge every 10 minutes; the stream is 23 feet

8 inches wide, average depth 3 feet 6 inches, rate 3½ miles per hour.

7. Find the values of 1,270 boards 15′ x 13″ x 1¼″ at $18.50 per M. 1,750 scantlings 16′ x 7″ x 3½″, at $23.75 per M. A pile of cordwood 5½′ x 26½′, at $3.75 per cord.

8. A merchant sold 4000 yds., of cotton at 7½ cents per yard. What should he remit his principal, his commission being 1¾ per cent. and expenses amounting to $45.60.?

(*A*) LOGARITHMS, AND (*B*) ALGEBRA.

Subject No. 4.

(*A*).

1. *(a)* What is the Logarithm of a number ?

(b) How many kinds are there in use, and what is the base of each ?

(c) Explain each part of a Logarithm, and give the name of each part.

(d) What operations of calculation can be performed by the use of Logarithms ?

2. Find the Logarithms of the following numbers; *(a)* 1; *(b)* 10; *(c)* 100; *(d)* .0002507; *(e)* 23764; and *(f)* 237.64.

3. Find the numbers corresponding to the following Logarithms, *(a)* .812913; *(b)* 2.524656; and *(c)* $\bar{1}$.276692.

4. Calculate the value of $\sqrt[6]{2\frac{1}{49}} \div \sqrt[5]{\frac{23}{11}}$

5. Multiply together the following by using Logarithms: 1728; .00024; .7462; 302.1 and 7.6094.

(*B*).

6. *(a)* Explain the difference between an exponent and a coefficient, and how are each treated in Multiplication and Division ?

(b) What is the law of signs in Multiplication ?

7. Remove the symbols of aggregation from the following:

(a) $2a - \{3b + [4c - 4a - (2a + 2b)] + [3a - \overline{b + c}]\}$

(b) $7a - \{3a - [(2a - 5a) + 6a]\}$

(c) $a - \{2b + [3c - 3a - (a + b)] + [2a - (b + c)]\}$

8. Divide by Horner's method:

$$6x^7 - x^6 - 11x^5 + 16x^4 + x^3 + 8x^2 - 19x + 20 \text{ by } 2x^3 + x^2 - 3x + 4$$

9. Factor *(a)* $x^8y^2 - 64x^2y^2$.

(b) $a^2 - b^2 + c^2 - 1 - 2a + 2bc$.

(c) $1 - 16a^2 + 8ac - c^2$.

10. A man has two horses and a saddle. The saddle is worth $10, and if it be put on the first horse his value with the saddle becomes double that of the second; but if the saddle be put on the second horse his value with it will not amount to that of the first horse by $13. Find the value of each horse.

EUCLID.

Subject No. 5.

1. *(a)* The greater side of a triangle has the greater angle opposite to it. I. 18.

(b) Prove I. 18 by producing a side.

2. ABC is a triangle with AC greater than AB. From AC cut off AD equal to AB. Produce AB to E, making AE equal AC. Join BD and EC. Prove that the angle DBC is equal to the angle BCE.

3. *(a)* If a straight line be divided externally into any two segments, the square on the straight line is equal to the squares on the two segments diminished by twice the rectangle contained by the segments.

(b) AB is a straight line, with its centre C, D is a point of unequal internal section, E is a point of external section: enunciate or give by numbers the propositions based upon these sections.

(c) Deduce algebraically II. 7 from II. 4.

4. Solve any one of the following deductions:

(a) In any triangle if a perpendicular be dropped from the vertex on the base, the difference of the squares on the sides is equal to the difference of the squares on the segments of the base.

(b) Find the point in the base of a triangle from which lines drawn parallel to the sides to meet them are equal.

(c) If A be the vertex of an isosceles triangle ABC, and CD be a perpendicular to AB. Prove that the sum of the squares on the sides of the triangle is equal to the sum of the square on BD, twice the square on AD, and three times the square on CD.

5. *(a)* In every triangle, the square on the side opposite an acute angle is equal to the sum of the squares on the other two sides diminished by twice the rectangle contained by either of those sides and the projection on it of the other side.

(b) State the relation of the square on the side of a triangle to the sum of the squares on the other two sides as the angle contained by these sides is acute, right or obtuse.

6 What is the purpose of Book II ? of Book III ?

7. From any point in the base of a right angled triangle a line is drawn at right-angles to the hypotenuse; prove that these lines are divided into segments whose rectangles differ by the square on the line so drawn.

8. *(a)* If two circles touch one another, internally at any point, the straight line which joins their centres, being produced, shall pass through that point (III 11).

(b) Two circles touch internally at a point, and through that point a straight line is drawn to cut the circumferences of the two circles. If the points of intersection be joined with the respective centres, the two straight lines will be parallel.

9. *(a)* Angles in the same segment of a circle are equal. Conversely: If two equal angles stand on the same arc, and the vertex of one of them be on the conjugate arc, the vertex of the other will also be on it (III. 21).

(b) If triangles having equal vertical angles stand on the same base, find the locus of their vertices. Show whether the angles at the base change their relations to each other.

10. *(a)* About a given circle describe a triangle equiangular to a given triangle. (IV. 3).

(b) Compare as to length the sides of an equilateral triangle inscribed in a circle with one described about it.

PLANE TRIGONOMETRY AND RULES FOR SPHERICAL.

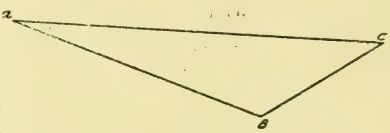
Subject No. 6.

1. Draw a figure showing by lines the trigonometrical functions of an arc, and give the definitions.

2. Show that the unit of circular measure is equal to 57° .2958 nearly. Reduce the angle 60 degrees to circular measure.

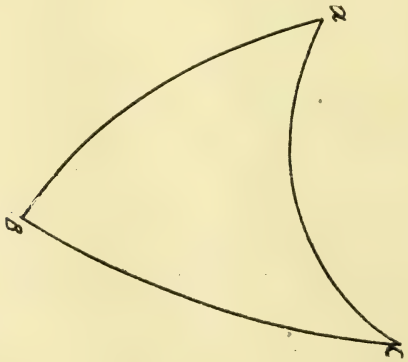
3. Give rules for solving plane right angled triangles. The four cases of right angled triangles. Give proofs of rules.

4. In surveying a Base Line in the District of Algoma, I find it necessary to calculate the distance AC. I measure the lines AB, BC, and angle B. $AB = 5.62$ chains; $BC = 3.20$ chains. Angle $B = 128^{\circ}\ 4'$. Find length of AC.?



5. Give Napier's rules for solving right angled spherical triangles.

6. In the spherical triangle ABC, right angled at B, the hypothenuse AC is 64 degrees, and the angle C 46 degrees. What are the remaining parts ?



Subject No. 7.

MENSURATION OF SUPERFICIES.

1. Find the area of a field bounded as follows: N. 34° 15′, E. 2 chs. 75 lks., N. 85°, E. 1 ch. 28 lks., S. 56° 45′, E, 2 chs. 20 lks., S, 34° 15′, W, 3 chs. 53 lks, N. 56° 30′, W. 3 chs. 20 lks. Give the area in acres, roods and perches.

2. The area of a rectangular field is 7½ acres, and the length of the diagonal is 50 perches. Required the sides in perches.

3. Find the area of a field one side of it being 198 links and seven ordinates to it measured at equal distances to the opposite curvilinear boundary being in order equal 60, 75, 80, 82, 76, 63 and 50 links.

4. State the rule for finding the area of a quadrilateral when the four sides and inclination of the diagonal are given.

Subject No. 8.

LINEAR DRAWING.

1. Draw a perpendicular to a straight line when the point is nearly over the end of the line.

2. Construct an equilateral triangle, the vertical height being two inches.

3. Draw a rectangle having its sides 1½ inches and ¾ inch respectively, and construct a square of equal area.

4. Draw two circles of one inch and half inch radius respectively, the centres being three inches apart. Draw two tangents to the two circles.

5. Draw a scale of inches six inches long, divide the first division into ten minor divisions, number the divisions properly, and print over it "Scale of inches."

6. Draw six lines, four inches long—No. 1, very fine; No. 2 medium; No. 3 fine dotted; No. 4 chain dotted; No. 5 heavy dotted; No. 6 heavy.

Subject No. 9.

CANADIAN AND GENERAL GEOGRAPHY.

1. Trace either by description or diagram, the main mercantile waterway of the Dominion, giving names of different parts, and principal towns on same.

2. Name the British possessions at present date.

3. State the principal Rivers and Mountain ranges of the world, and give names of the Countries in which they are situated.

4. Over what oceans would it be necessary to pass, to circumnavigate the world. Name the principal groups of Islands in them.

5. Give the names of the Capitals of the principal countries of Europe and Asia.

Subject No. 10.

CANADIAN HISTORY.

1. Give names of the principal explorers of Canada during the French regime, and points of discovery of same.

2. Give names and location of the principal Indian tribes of Canada at the time of the British occupation.

3. Give dates and principal battles of the Wars in Canada with the United States.

4. State concisely the circumstances that led up to the establishment of "Responsible Government" in Canada.

5. At what date did Confederation take place, and what was the form of Government established by the British North America Act?

FINAL EXAMINATION.

Subject No. 1.

GEOMETRY.

1. Book I, Prop. 43. The complements of the parallelogram, which are about the diameter of any parallelogram, are equal to one another.

2. On a given line describe a square of which the line shall be the diagonal.

3. If two sides of a triangle be produced, the lines, which bisect the two exterior angles and the third interior angle, meet all in one point.

4. Book II, Prop. 5. If a straight line be divided into two equal parts, and also into two unequal parts, the rectangle contained by the unequal parts, together with the square of the line between the points of section, is equal to the square of half the line.

5. Book III, Prop. 36. If from any point without a circle two straight lines be drawn, one of which cuts the circle and the other touches it, the rectangle, contained by the whole line which cuts the circle and the part of it without the circle, shall be equal to the square of the line which touches it.

6. Given the area and hypothenuse of a right angled triangle; construct it ?

7. Book IV, Prop. 9. To describe a circle about a given square.

8. Book VI, Prop. 8. In a right angled triangle, if a perpendicular be drawn from the right angle to the base, the triangles on each side of it are similar to the whole triangle and to one another.

9. Book VI, Prop. 30. To cut a given straight line in Extreme and Mean ratio.

10. Define "Homologous," "Ex Equali," "Analogy," "Ratio," "Proportionals."

Subject No. 2.

ALGEBRA.

1. Simplify:

(a) $$\frac{\frac{1}{1-x} - \frac{1}{1+x}}{\frac{1}{1-x} + \frac{1}{1+x}}$$

(b) $$\frac{\frac{a^2}{b^3} + \frac{1}{a}}{\frac{a}{b^2} - \frac{a-b}{ab}}$$

(c) $$\frac{1}{x + \frac{1}{\frac{x+1}{1+\frac{x+1}{3-x}}}}$$

2. Prove that any ratio is made more nearly equal to unity by adding the same number to each of its terms.

3. What is the

(a) Arithmetical ratio of $x^4 - 1$ to $x + 1$.

(b) the Geometrical ratio of the same.

4. A man performed a journey of 48 miles in a certain number of hours but if he had travelled 4 miles more each hour he would have performed the journey in 6 hours less time. What was his rate per hour ?

5. Solve:

$$\sqrt{x^2 - a^2 - b^2} + \sqrt{x^2 - b^2 - c^2} - \sqrt{x^2 - c^2 - a^2} = x$$

6. Define:

(a) Arithmetical Progression; Geometrical Progression; Harmonical Progression.

(b) Insert 5 Harmonic means between 1 and 7.

7. Find two numbers whose sum is nine times their difference and whose product diminished by the greater number is equal to twelve times the greater number divided by the less.

8. *(a)* Find the greatest term in the expansion of $(a + b)^{20}$ when $a = 2$ and $b = 3$.

8. *(b)* Find the value of the greatest term in the following: $(a - b)^{2r}$.

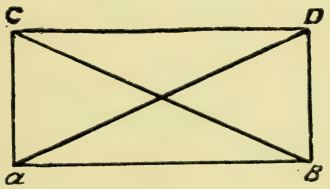
when $a = 2$, $b = 3$, $r = 4$.

Subject No. 3.

TRIGONOMETRY (PLANE AND SPHERICAL).

1. Give the rules and prove the same for solving plane triangles. *(a)*. Given one side and two angles, each adjacent to given side. *(b)*. Given one side and two angles, one adjacent and the other opposite, to given side. *(c)*. Given two sides and included angle.

2.



$AB = 1000$ yds. Angles $BAC = 76° 30'$, $BAD = 44° 10'$, $ABD = 81° 12'$, $ABC = 46° 5'$. Find distance CD.

3. Give Napier's rules for the circular parts for solving spherical triangles, with proofs for same.

4. In the spherical triangle ABC, right angled at B, the hypothenuse $AC = 64$ degrees, the angle $C = 46$ degrees. What are the remaining parts ?

5. What is spherical excess and what useful purpose may it be made to serve.

6. What is a quadrantal spherical triangle and how are they solved ?

7. Show that the unit of circular measure is equal to 57°.2958 nearly.

Reduce the angle 60° to circular measure.

SUBJECT No. 4.

MENSURATION AND LAYING OUT LAND.

1. Give the method of finding the area of any irregular polygon.

2. State rule to find area of a quadrilateral, when the four sides and inclination of the diagonals are given.

3. Find the length of an arc of a circle whose diameter is 125 and number of degrees in the arc 54° 36″.

4. Prove rule for dividing a triangular piece of land into two parts having a given ratio to each other, by a line through a given point within the boundaries.

5. Find the area of field, one side of it being 198 links and seven ordinates to it measured at equal distances to the opposite curvilinear boundary being in order, equal 60, 75, 80, 82, 76, 63 and 50 links.

6. Find the number of acres in a quadrilateral field whose diagona's are 30 and 40, and the contained angle 60°.

SUBJECT No. 5.

RE DESCRIPTIONS OF LANDS.

1. *(a)* Give a definition of the word "description," as used in a technical sense by O. L. Surveyors.

(b) When is a description complete in itself ? Write one.

(c) When is a description incomplete ? Write one.

(d) Give example of wrong description by referring to defective points that may occur.

(e) Give a list of the different kinds of descriptions of lands in various forms which may occur in practice.

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2. Lot 35 in Concession A, single front, in Township Block is the last lot in the Concession, the town line being along the north side. The Patent from the Crown describes the lot as 200 acres and sides 100 chains and ends 20 chains each, on Survey Lot found to be north side 105 c, south side 101 c, west end 22 c., east end 25 c. In said Patent courses of sides said to be N 74° E, and ends N 9° W.

(a) A description is required of the east and west halves, each, giving the dimensions in detail.

(b) Also a description of the north-east quarter in detail. tail.

(c) Also a description of a school lot of two acres on the north-west corner, with frontage on west end of two chains.

(d) Also a description in detail of the westerly 100 acres.

(e) Show by sketch the south-east quarter of the south-east quarter of the north-west quarter of said lot.

In all above cases show sketch with description, and calculations may be made approximate.

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3. Lot 10, Concession A, single front, Township Block, is 100 c by 20 c, and sides N 74° E, and ends N 16° W.

(a) Required a description of a road to be laid out across the lot, the centre line of which commences at the south-west angle of the lot, and ends at the north-east angle of the west half of the lot, road to be 1 chain wide; make description in detail, with sketch.

(b) Give a description of the east half of said lot with a right of way over the west half of said lot, 50 links wide along the south side of west half. Show by sketch also a description to be in detail.

(c) Write a description of the north-easterly half of the lot as cut off by a diagonal line from north-west corner to south-east corner; description to be in detail.

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4. *(a)* Mr. White owns lot 20, plan 1,000, part of township lot 35, Concession 1, Township H; the lot is 50′ x 150′, front N 16° W and sides N 74° E. He has a double house built on the lot; the party or middle wall is, or is supposed to be, on the south limit of the N half of the lot. He wants a description to cover the north half of the lot, but to include the north semi-detached house. House 10′ from front, and 60′ deep, and each 20′ wide.

(b) Write also a description of the south half of said lot, considering it not built upon. Description to be in detail.

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5. *(a)* A man owns lot 10, Concession 1, Township A, 20 c x 100 c, 200 acres; saw-mill on west half and pond floods part of east half. Sells west half, and is to give right to flood east half to working head of pond, and right of way 50 links wide along south side east half. Required a description for Deed. Bearings, front of lot N 16° W, and sides N 74° E.

(b) Also write a description for the remaining part of the east half of said lot.

Subject No. 7.

LAYING OUT CURVES.

1. Explain the method of laying out a curve by deflection angles, and prove the ratio of the angle of deflection to the angle at centre.

2. Illustrate method of passing an obstacle, such as a large building, in laying out a curve.

3. What is a compound, and what a reverse curve? Give diagrams of each.

4. Given deflection angle, between tangents 48° 16″ and radius 112 feet, find other angles and distances necessary to lay out the curve.

Subject No. 8.

ASTRONOMY.

1. Define Horizon, Zenith, Nadir, Parallax, Refraction. Explain fully the effects of the latter two in astronomical work.

2. Find the altitude and azimuth of Ursa Majoris (Declination 62° 33′ N.) to an observer at latitude 39° 57′ N. when the hour angle of the star is 5h. 17m. 40s. E.

3. At a place in latitude 25° 40′ N., the sun's correct central altitude was found to be 10° 6′ 27″, when his declination was 8° 5′ 56″ S., what was his distance from the meridian?

4. At a place in latitude 42° 34′N., nearly the altitude of Aldebaran (Declination 16° 12′ 26″ N.), was found by observation to be 39° 2′ 10″, when its hour angle was 3h. 25m. 40s. what was the latitude of the place?

5. The altitude of the pole star being found 39° 1′ 39″, the hour angle 5h. 36m. 41s. from the upper culmination, and the polar distance 1° 28′ 7.68″, required the latitude of the place.

6. On the 1st of January, 1852, the sun's right ascension was 18 hours, 44m., 49.47s., and his declination 23° 3′ 28″ S.,—required his longitude.

7. Give a full description of the precautions necessary to be observed in astronomical observations in order to insure accuracy.

8. Explain fully the cause of day and night and the changes of the seasons, and why it is hot in summer and cold in winter in this latitude, and what effect (if any), would a change in the obliquity of the ecliptic have upon the climate.

SUBJECT No. 9.

RE SURVEY ACT.

1. *(a)* Describe the different kinds of original surveys by Government.

(b) Describe the different kinds of original surveys by private persons and Corporations.

(c) Describe municipal surveys, different kinds and under what precedent do they take the place of original surveys.

(d) What plans, notes and affidavits are received as evidence in Courts ?

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2. *(a)* How are lines between lots run in single front concessions ? Give the different cases which might occur.

(b) How are lines between lots run in double front concessions ? Give the different cases which might occur.

(c) How are lines between lots run in sectional concessions, *i.e.*, where run out in blocks as per Order-in-Council, 27th March, 1829 ? Give different cases which might arise.

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3. *(a)* How would you locate the corner of a lot when the original stake is lost ?

(b) How would you locate a concession line when part is lost ?

(c) How would you locate a concession line which was never run ?

(d) How would you locate a concession line when the whole is lost ?

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4. *(a)* How would you re-survey Government town plots where original stakes are lost ?

(b) How would you re-survey town plots by Corporations where original stakes are lost ?

(c) How would you re-survey town plots by private persons where original stakes are lost ?

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5. *(a)* Under what circumstances can an O. L. S., take affidavits ?

(b) How can an O. L. S. compel attendance of witnesses?

(c) To what extent is an O. L. S., allowed to pass over private property ?

(d) Are O.L.S. bound to keep Field Notes, and if so, how?

SUBJECT NO. 10.

RE DITCHES AND WATER COURSES ACT.

1. *(a)* State the law and precedent as to appointing Engineer.

(b) State the law and precedent as to friendly meeting.

(c) State the law and precedent as to notifying the Engineer.

(d) State the law and precedent as to examination and award by Engineer.

(e) State the law and precedent as to completing work by Engineer when individuals fail.

(B) RE MUNICIPAL DRAINAGE.

2. *(a)* State law and precedent as to commencing work on Petition.

(b) State law and precedent as to appointing Engineer and oath of office.

(c) State law and precedent as to survey and assessment and report.

(d) State law and precedent as to adjoining municipalities.

(e) Define and give illustrations of the meaning of the terms "benefit liability," "injuring liability," and "outlet liability."

(c) RE REGISTRY ACT.

3. *(a)* State how plans should be prepared for registration.

(b) State how plans can be registered where surveys or sub-divisions have been made before 4th March, 1868.

(c) State how plans of cities, towns and villages, which were sub-divided at different times should be made and registered.

(d) RE MINING ACT.

4. *(a)* State how mining claims and locations should be surveyed, and plans and descriptions made in unsurveyed territory.

(b) State how mining claims and locations should be surveyed, and plans and descriptions made in surveyed territory.

Subject No. 11.

LEVELLING.

1. Describe the adjustments necessary for a Wye. Wherein do they differ in a Dumpy ?

2. Give a form for a field book and show typical set of observations reduced to a common Datum.

3. Give form for cross section book.

4. What is a level line ?

5. How would you take into account the sphericity of the earth and allow for it in actual work ?

SUBJECT No. 12.

EVIDENCE.

1. Define the term evidence.

2. What is the best evidence ?

3. Secondary evidence. When is it admissible ?

4. What is hearsay ? and when, if ever, is it allowable ?

5. What position do you consider you occupy when acting as a Surveyor ? What attitude do you consider you should take with regard to evidence ?

6. Draw up an affidavit in full to establish a post.

SUBJECT No. 14.

MINERALOGY AND GEOLOGY.

1. Define conformable and contorted strata. Interstratified and disrupting masses, and fissures and fractures of rock formations.

2. State situation and the constituent rocks of the Huronian and Silurian formations in Ontario.

3. In what geological formations, and in what localities do iron, corundum, nickel and gold, principally occur in Canada?

4. What are the constituents of trap and green stones, and in what manner do they usually occur ?

5. What is Graphite, and what is usually called "Phosphates?"

In what localities in Canada do they principally occur?

6. Name some distinctive fossils of the carboniferous and Silurian formations; and name principal coal deposits of the Dominion.

SUBJECT No. 15.

BOTANY AND FOREST FLORA.

1. What are the parts of a flower? Illustrate by diagrams, and give full descriptions and the use of each part.

2. What is a fruit in Botany? Explain the structure of an apple, grape, almond, strawberry and pine-apple.

3. Describe the structure of endogenous and exogenous stems. How do they differ in growth?

4. Describe the germination of a plant.

5. Name ten trees of Ontario and give their botanical names. What are their economic uses.

LIST OF MEMBERS.

31st July, 1901.

The names of those members granted exemption by By-laws ratified by the Association are marked *.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Abrey, George Brockitt, Toronto Junction, ...10th Jan., 1860
D.L.S.

Allan, John Richard, Renfrew.....6th Nov., 1894
Grad. S.P.S.

Aylsworth, Charles Fraser, Jr., Madoc.....8th Jan., 1886
D.L.S.

Aylsworth, John Sidney, Selby, P.O. Box 23...9th Jan., 1871
D.L.S.

Aylsworth, William Robert, Belleville,
P.O. Box 2.....8th Nov., 1861
D.L.S.

Baird, Alexander, Leamington.....7th July, 1877
D.L.S., C.E.

Barrow, Ernest George, Hamilton.....4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.

Bazett, Edward, Burk's Falls.....8th July, 1881
D.L.S.

Beatty, David, Parry Sound.....12th July, 1869
D.L.S.

Beatty, Herbert John, Eganville.....8th Nov., 1893
Grad. S.P.S.

Beatty, Walter, Delta.....19th July, 1858
D.L.S., M.P.P.

Bell, James Anthony, St. Thomas.....11th Oct., 1875
D.L.S., Co. Engineer, Elgin. City Engineer, St. Thomas.

Bigger, Charles Albert, Ottawa, 68 Daly Ave..6th Jan., 1882

Bolton, Ellsworth Doan, Listowel.....7th Nov., 1899
B.A.Sc. (McGill)

Bolton, Lewis, Listowel.....9th July, 1864
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Boswell, Elias John, Peterborough.....7th Nov., 1896
Grad. S.P.S.

Bowman, Clemens Dersteine, West Montrose. 10th July, 1879

Bowman, Herbert Joseph, Berlin.....7th Jan., 1887
D.L.S., Grad. S.P.S., Treasurer County Waterloo. Assoc. Mem. Can. Soc. C.E.

Bray, Edgar, Oakville.....6th Oct., 1866
D.L.S.

Bray, Harry Freeman, Oakville.....10th July, 1882

Bray, Samuel, Ottawa, Dept. of Indian Affairs..6th Jan., 1877
C.E., D.L.S.

Brown, George Laing, Morrisburg.....19th Feb., 1898
Grad. S.P.S.

*Brown, John Smith, Kemptville.....8th July, 1852
D.L.S.

Browne, Harry John, Toronto. 18 Toronto st..6th July. 1872
C.E.

Browne, William Albert, Toronto,
18 Toronto st.....10th April, 1876

Burt, Frederick Percy, New York, N.Y.....8th July, 1885
Manager and Treasurer Engineering News Pub. Co., 220 Broadway.

Butler, Matthew Joseph, 22 Wellington Place, Toronto.
.....11th Jan., 1878
M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., C.E.

Byrne, Thomas, Sault Ste. Marie.....15th July, 1862
D.L.S.

*Caddy, Cyprian Francis, Campbellford.....10th July, 1860
D.L.S.

Caddy, John St. Vincent, Ottawa, 559 King st..6th Oct., 1866
D.L.S.

Cameron, Alfred John, Peterborough.....9th April, 1889

Campbell, Archibald William, Toronto,
Parliament Building .....10th April, 1885
C.E. Provincial Instructor in Road Making.

Carpenter, Henry, Stanley, B.A., Sc.
(Toronto Univ.), Collingwood.....25th Feb., 1899

Carre, Henry, 193 Sparks St., Ottawa.....8th Nov., 1861
M.O. & Georgian Bay Canal, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.

*Carroll, Cyrus, Prince Albert, Sask..... 10 Jan., 1860
Mem. Can. Soc. C.E., D.L.S.

Casgrain, Joseph Philippe Baby, Morrisburg...5th Jan., 1888
D.L.S., P.L.S., (Que.) C.E., Assoc. Mem. Can. Soc., C.E., Chief Eng. M. & P.J. Ry.

Cavana, Allan George, Orillia.....8th July, 1876
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Chalmers, John, Port Arthur, per Ont. & R.R. R'y Co.....14th April, 1896
Grad. S.P.S.

Charlesworth, Lionel Clare, Rat Portage.....14th April, 1896
Grad. S.P.S., Agent Bureau of Mines (Ont.).

*Cheesman, Thomas, Mitchell.....11th July, 1856
D.L.S.

Chipman, Willis, Toronto, 103 Bay st.....4th Oct., 1881
B.A.Sc. (McGill), Mem. Am. Soc. C.E.; Mem. Can. Soc. C.E.

Code, Abraham Silas, Alvinston.....14th April, 1896

Cozens, Joseph, Sault Ste. Marie.....7th July, 1875
D.L.S.

*Davidson, Alexander, Arkona.....11th Oct., 1858
D.L.S.

Davis, Allan Ross, Napanee.....8th Jan., 1886
B.A.Sc. (McGill.)

Davis, John, Alton.....5th April, 1878

Davis, William Mahlon, Berlin.....11th April 1885
Grad. R.M.Coll., (Kingston), Town Engineer.

Deacon, Thomas Russ, Rat Portage.....12th Nov., 1892
Grad. S.P.S., Mgr. Mikado Mine.

Deans, William James, Oshawa.....11th July, 1884

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dickson, James, Fenelon Falls.....6th April, 1867
D.L.S.

Dobbie, Thomas William, Tilsonburg.....11th July, 1856
D.L.S.

Dobie, James Samuel, Port Arthur.....21st Feb., 1898
B.A.Sc. (Toronto Univ.).

Doupe, Joseph, Winnipeg, Man., 169 Edmonton st.....13th Jan., 1863
D.L.S., P.L.S. (Man.), C.E. (McGill)., P.L.S. (B.C.).

Ducker, William A., Winnipeg, Man., 334 Pacific ave.....6th April, 1882
D.L.S., P.L.S. (Man.) Swamp Lands Com.

Esten, Henry Lionel, Toronto, 157 Bay st....7th Jan., 1887

Evans, John Dunlop, Trenton.....8th July, 1864
D.L.S., C.E., Chief Eng. Cent. Ont. Ry., Eng. for Weddell Bridge & Engine Works.

Fair, John, Brantford.....13th April, 1875

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Fairbairn, Richard Purdom, Toronto,
127 Major st.....7th Oct., 1876
Surveyor for Dept. of Pub. Works, Ontario.

Fairchild, Charles Court, Simcoe.....9th April, 1894
Grad. S.P.S.

Fairchild, William Howard, Simcoe.....17th Feb., 1900

Farncomb, Alfred Ernest, Fort William.....9th April, 1895

Farncomb, Frederick William, London,
213 Dundas st.....6th Nov., 1889

Fawcett, Thomas, Niagara Falls.....6th Jan, 1881
Dom. Topographical Surveyor.

Fitton, Charles Edward, Orillia, Box 142....10th April, 1879
D.L.S.

Flater, Frederick William, Petrolea.....9th April, 1888

Ford, William Butterton, Hamilton,
42 James St., N.....21st Feb., 1898

Francis, John James, Sarnia P.O., Box 304...16th Oct., 1861
D.L.S.

*Fraser, Charles, Wallaceburg.....5th Aug., 1847
D.L.S.

Galbraith, William, Bracebridge.....4th April, 1883
D.L.S.

Gamble. Killaly, Toronto, 88 Charles st.....6th April, 1888
D.L.S., P.L.S. (Man.), Captain R.A. (Ret'd).

Gardiner, Edward, St. Catharines.....6th Jan., 1866
D.L.S.

Gaviller, Maurice, Collingwood, Box 164.....6th Jan., 1866
C.E. (McGill), D.L.S.

Gibson, Harold Holmes, Willowdale.....8th Sept., 1891

*Gibson, James Alexander, Oshawa.....7th April, 1855
D.L.S.

Gibson, Peter Silas, Willowdale.....19th July, 1858
C.E. M.S. (Mich. Univ.) D.L.S., Mem. Can. Soc. C.E., Engineer Tp. of York.

Gibson, Wilbert Silas, Willowdale.....21st Feb., 1898

Gillon, Douglas John, Fort Frances.....9th Nov., 1895
Grad. R.I.E. Coll.

Graydon, Aquila Ormsby, London.....8th July, 1880
City Engineer.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Hanning, Clement George, Preston,
Lock Box 130.....19th July, 1858
D.L.S., C.E, (Trin. Coll., Dublin).

Hart, Milner, Toronto, 103 Bay st.....11th July, 1863
D.L.S.

Harvey, Thomas Alexander, Steelton, Penn...13th Nov., 1893
C.E. (R.P.I., Troy, N.Y.)

Heaman, John Andrew, London,
Albion Building.....16th Nov., 1896

Henry, Frederick, London, Albion Building..7th April, 1887

*Hermon, Royal Wilkinson, Rednersville....13th July, 1857
D.L.S.

Hobson, Joseph, Montreal, G. T. Ry. Office.....3rd Oct., 1855
D.L.S., Chief Eng. Grand Trunk Railway System.

Hopkins, Marshall Willard, Hamilton.....13th Nov., 1893
D.L.S., B.A.Sc. (McGill), Assoc. Mem. Can. Soc. C.E., Chief Engineer I.R.R.C.

Hutcheon, James, Guelph.....10th Nov., 1891
Grad. S.P.S., City Engineer.

Irwin, James Moore, Rat Portage.....13th Jan., 1863
D.L.S.

Jackson, James Herbert, Windsor.....16th Feb., 1901

James, Darrell Denman, Michipicoten Harbour...3rd Nov., 1891
B.A., B.A.Sc. (Toronto Univ)

James, Silas, Toronto, 114 Shuter St.....19th July, 1858
D.L.S.

Jones, Charles Albert, Petrolea.....8th April, 1881
D.L.S.

Jones, John Henry, Sarnia, Box 194.....10th Oct., 1886
D.L.S.

Jones, Thomas Henry, Brantford.....10th Oct., 1878
B.A.Sc. (McGill). D.L.S. City Engineer.

*Keefer, Thomas Coltrin, Ottawa.....14th Aug., 1840
D.L.S., C.E.

Kennedy, James Henry, St. Thomas.....7th April, 1887
C.E. (Toronto Univ), Mem. Can. Soc. C.E., Engineer of V.V. & E. Ry.

Kirkpatrick, George Brownly, Toronto,
Dept. of Crown Lands.....13th April, 1863
D.L.S., Director of Surveys.

Laird, James Stewart, Essex.....6th April, 1867
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Laird, Robert, Rat Portage.....11th Nov., 1887
Grad. S.P.S.

Lewis, John Bower, Ottawa, Brunswick House .....4th Oct., 1883
D.L.S., P.L.S. (Quebec), C.E.

Lougheed, Aaron, Port Arthur,.....12th Nov., 1888
D.L.S.

*Low, Nathaniel Edward, Wiarton.....11th July, 1856
D.L.S.

Lumsden, Hugh David, Toronto, 63 Homewood ave.....4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.

Macdougall, Allan Hay, Port Arthur.....11th April,1859
D.L.S., Town Engineer.

MacKay, James John, Woodstock.....25th Feb., 1899

MacKenzie, William, Sarnia.....11th April, 1896
Grad. R.M.C. (Kingston).

MacKenzie, William Lyon, Cranbrook, B.C.....7th April, 1887
C.E.

MacPherson, Duncan, Montreal, P.Q.....9th Jan., 1884
Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. Eastern Div. C.P. Ry.

McAree, John, Rat Portage.....6th April, 1867
Dominion Topographical Surveyor, B.A.Sc., (Toronto Univ)

McCubbin, George Albert, St. Thomas, City Engineer's Office..... .....9th Nov., 1895
Assist. City Engineer.

McDonell, Augustine, Chatham, 4 & 5 Ebert's Block.....11th July, 1863
D.L.S.

McDowall, Robert, Owen Sound.....11th Nov., 1890
Grad. S.P.S, Town Engineer

McEvoy, Henry Robinson, St. Marys.....10th July, 1875
D.L.S.

McFadden, Moses, Neepawa. Man.....13th April, 1858
D.L.S., P.L.S. (Man.)

McFarlen, George Walter, Toronto, City Hall, Assistant City Engineer's Office 11th Nov.,1889
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

McGeorge, William Graham, Chatham, Box 225.....8th Jan., 1866
D.L.S.

McGrandle, Hugh, Huntsville.....5th Jan., 1883
D.L.S.

McKay, Owen, Windsor, P.O. Box 167.....7th Jan., 1887
Grad. S.P.S., Chief Eng. D. & L. E. Ry.

McKenna, John Joseph, Dublin.....9th July, 1860
D.L.S.

McLatchie, John, Nelson, B.C., P.O. Box 128....9th Jan., 1864
D.L.S.. P.L.S. (Que., Man. and B.C.).

McLean, James Keachie, Elora.....8th April, 1876
D.L.S.

McLean, William Arthur, Toronto, Parliament Buildings .....21st Feb., 1898
Secretary of Roads.

McLennan, Murdoch John, Williamstown...13th Nov., 1893
B.A.Sc. (McGill), D.L.S.

McLennan, Roderick, Toronto, 115 Avenue Rd.....20th June, 1846
D.L.S.

McNab, John Duncan, Owen Sound.....9th Oct., 1879

McNaughton, Finlay Donald, Cornwall.....25th Feb., 1899

McPherson, Archibald John, Brockville.....10th April, 1897
B.A.Sc. (Toronto Univ.)

McPherson, Charles Wilfrid, Dawson, N.W.T. c/o Dep't of Interior .....21st Feb., 1899

McPhillips, George, Winnipeg,.....9th July, 1885
D.L.S., P.L.S. (Man.)

Manigault, William Mazyck, Strathroy, P.O. Box 300.....8th July, 1876
D.L.S.

Marshall, James, Holyrood.....6th Oct., 1866
D.L.S.

Meadows, William Walter, St. Thomas.....21st Feb., 1898
Grad. S.P.S.

Miles, Charles Falconer, 268 Triangle St., Buffalo, N.Y.....13th Jan., 1862
D.L.S.

Miller, Frederick Fraser, Napanee.....8th Jan., 1885

Moore, John MacKenzie, London, Albion Building.....9th Oct., 1879

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Moore, John Harrison, Smith's Falls.....11th Nov., 1889
Grad. S.P.S.

Morris, Alfred Edmund, Perth.....10th April, 1879

Morris, James Lewis, Pembroke.....7th July, 1886
D.L.S., C.E. (Toronto Univ

Mountain, George Alphonse, Ottawa.....9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.) Chief Eng. Can. Atlantic and O.A. & B. Ry.

Murdoch, William, Toronto, 37 Bloor St. E.....10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto, 157 Bay st..6th Oct., 1886

Nash, Thomas Webb, Kingston.....7th April, 1854

Newman, John James, Windsor.....21st Feb., 1898

Newman, William, Windsor,
57 Sandwich st. w.....12th Nov., 1892
Grad. S.P.S.

Niven, Alexander, Haliburton.....8th July, 1859
D.L.S.

Ogilvie, William, Dawson City, Yukon Dist..12th July, 1869
D.L.S. Commissioner for Yukon District.

O'Hara, Walter Francis, Chatham.....14th April, 1892
D.L.S.

Patten, Thaddeus James, Little Current.....5th Jan., 1883

Peterson, Peter Alexander, Montreal, P.Q...16th July, 1863
D.L.S., C.E., Mem. Can. Soc. C.E., Chief Engineer Can. Pac. Ry.

Pinhey, Charles Herbert, Ottawa,
552 Gilmour St.....12th Nov., 1888
D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

Proudfoot, Hume Blake, Port Arthur .....6th Jan., 1882
D.L.S., C.E. (Toronto Univ.)

Rainboth, Edward Joseph, Ottawa.....11th Nov., 1887
D.L.S.

Rainboth, George Charles, Aylmer, P.Q.....11th July, 1868
D.L.S., P.L.S. (Que.)

Reinhardt, Carl, Montreal, 340 Mountain St.....25th Feb., 1899
B.A.Sc. (McGill.)

Reynolds, Samuel Henry, Rat Portage.....17th July, 1880

Roberts, Vaughan Maurice, St. Catharines...5th April, 1887

Robertson, James, Glencoe.....11th July, 1885
Grad. S.P.S.

Robinson, Franklin Joseph, Kirkfield.....21st Feb., 1898
Grad. S.P.S., Asst. Engineer Trent Canal.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Roger, John, Mitchell.....10th Nov., 1888
Grad. S.P.S.

*Rombough, Wm. R., Toronto, 61 Walton St...14th Nov., 1848
D.L.S.

Rorke, Louis Valentine, Sudbury.....14th April, 1890
D.L.S.

Ross, George, Welland.....10th July, 1879
B.A.Sc. (McGill), D.L.S.

*Rubidge, Tom S., Cornwall.....9th Feb., 1849
D.L.S., Asst. Eng. Dept. Rys. and Canals.

Russell, Alexander Lord, Port Arthur.....16th April, 1873
D.L.S., P.L.S. (Que.).

Sankey, Villiers, Toronto, City Hall.....11th Jan., 1878
D.L.S., City Surveyor.

Saunders, Bryce Johnston, Regina, N.W.T.....7th Jan., 1885
B.A.Sc. (McGill), D.L.S.

Scane, Thomas, Ridgetown.....7th Jan., 1865
D.L.S.

*Schofield, Milton C.,
185 14th St. Buffalo, N.Y.....28th Sept., 1843
D.L.S.

Schwitzer, John Edward, Rat Portage.....16th Nov., 1896
Town Engineer, B.A.Sc. (McGill).

Seager, Edmund, Rat Portage.....8th July, 1861
D.L.S.

Selby, Henry Walter, Dinorwic,
Dist. of Rainy River.....8th Jan., 1876
D.L.S.

Sewell, Henry DeQuincy, Toronto, 29 St. Mary St. 9th July, 1885
D.L.S., A.M.I.C.E.

Shaw, John Henry, Pembroke.....17th Feb., 1900
Grad. S.P.S.

Silvester, George Ernest, Sudbury.....12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Meaford, P.O. Box 3.....9th Jan., 1879
D.L.S.

Smith, Angus, Stratford.....14th April, 1896
Grad. S.P.S., City Engineer.

Smith, George, Woodville, P.O. Box 77. ...7th April, 1881
Engineer for Co. Victoria and four Townships.

Smith, Henry, Toronto, Crown Lands Dept...8th Nov., 1861
D.L.S., Mem. Can. Soc. C.E.

Speight, Thomas Bailey, Toronto,
Yonge St. Arcade.....6th Jan., 1882
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Squire, Richard Herbert, Brantford,
103 Dalhousie St.....14th April, 1896
B.A.Sc. (Toronto University).

Steele, Edward Charles, Port Arthur.....9th April, 1889
Assoc. Mem. Can. Soc. C.E.

Stewart, Elihu, Ottawa, Dept. of the Int.....8th April, 1872
D.L.S., Chief Inspector of Timber and Forestry.

*Stewart, George Alexander, Calgary, Alta....8th July, 1852
D.L.S.

Stewart, John, Montreal.....11th Nov., 1887
D.L.S.

Stewart, Walter Edgar, Aylmer.....12th April, 1892

*Strange, Henry, Rockwood.....30th Nov., 1838
D.L.S., C.E

Stull, William Walter, Sudbury.....17th Feb., 1900
B.A.Sc. (Toronto Univ.)

Taylor, William Verner, Gananoque .....7th Nov., 1896
Grad. S.P.S.

Traynor, Isaac, Dundalk.....16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man.,
C. P. R. Eng. Office.....6th July, 1878
D.L.S., C.E. (Toronto Univ)

Tyrrell, James Williams, Hamilton,
42 James st. n.....8th April, 1885
C.E. (Toronto Univ.), D.L.S., Co. Eng. for Wentworth.

*Unwin, Charles, Toronto, 126 Seaton st....12th April, 1852
D.L.S.

Ure, Frederick John, Woodstock.....7th April, 1887
C.E.

Van Buskirk., William Fraser, Rosland .....7th April, 1888
Grad. R.M. Coll. (Kingston), City Engineer.

Van Nostrand, Arthur J., Toronto,
Yonge St. Arcade..... .....30th Oct., 1882
D.L.S.

Wadsworth, Vernon Bayley, Toronto,
103 Bay st.....9th April, 1864
D.L.S.

Wagner, William, Ossowo, Man.....13th April, 1858
D.L.S.

Walker, Alfred Paverley, Toronto, Room 508,
Union Station, C. P. Ry., Eng. Office.....6th Jan., 1882
D.L.S., Mem. Can. Soc. C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Wallace, James Nevin,
Calgary, Alta.....21st Feb., 1898
B.A., B.E. (Trin. Coll Dublin).

Ward, Archeson Thomas,
Wabigoon Dist. of Rainy River .....10th April, 1897

Warren, James, Walkerton, P.O. Box 190.....7th Oct., 1864
D.L.S.

Watson, John McCormack, Orillia,
P.O. Box 224.....13th April, 1892

*Weatherald, Thomas, Goderich,
P.O. Box 273.....12th Jan., 1856
D.L.S., C.E.

Weekes, Melville Bell, Brantford.....17th Feb., 1900
B.A.Sc. (Toronto Univ.)

West, Robert Francis, Orangeville.....7th April, 1881

Wheelock, Charles Richard, Orangeville.....7th Jan., 1886
Treasurer County of Dufferin.

Whitson, James Francis, Toronto,
Crown Lands Dept.....9th Jan., 1886

Wicksteed, Henry King, Cobourg.....7th Jan., 1886
D.L.S., C.E.

Wiggins, Thomas Henry, Finch, Ont.....10th Nov., 1891
Grad. S.P.S., D.L.S., Town Engineer.

Wilde, John Absalom, Sault Ste. Marie.....9th April, 1889

Wilkie, Edward Thomson, Carleton Place...11th April, 1891
D.L.S.

Williams, David, 220 Queen St., Kingston..... 9th April, 1864
D.L.S.

*Winter, Henry, Thornyhurst.....11th July, 1853
D.L.S., C.E.

*Wood, Henry O., Billings' Bridge.....10th Oct., 1855
D.L.S.

*Yarnold, William Edward, Port Perry,
P.O. Box 44.....7th April, 1854
D.L.S.

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked * ; and under By-Law No. 45 are marked †.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Anderson, John Drummond, Trail, B.C.....13th April, 1892

Apsey, John Fletcher,
Cumberland, Md.....6th Jan., 1886
Grad. S.P.S.

Aylsworth, Charles Fraser, Sr., Madoc.....2nd April, 1861
D.L.S.

Blake, Frank Lever, Toronto,
Meteorological Office .....13th April, 1875
D.L.S.

Bell, Andrew, Almonte.....6th Oct., 1866
D.L.S.

Bolton, Jesse Nunn, Toronto, 264 Major St.....6th April, 1867

Booth, Charles Edward Stewart,
Westmount, P. Q.....6th April, 1882

Bowman, Arthur Meyer, Mahan,
Beaver Co., Pa.....11th Nov., 1887
Grad. S.P.S., Staff of U.S. Engineers.

Bowman, Franklin Meyer, Bellevue,
Allegheny Co., Pa.....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., P.O. Box 815..15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C.....8th July, 1861
P.L.S. (B.C.).

Carbert, J. Alfred, St. Joseph, Mich.....7th April, 1876
D.L.S. Staff of U. S. Engineers.

Coleman, Richard Herbert, Toronto, Canada
Co. Offices, Imperial Bank Chambers....6th Oct., 1877

Drewry, William Stewart, Ottawa,
Dept. of the Interior.....5th April, 1883
D.L.S.

Edwards, George, Thurso, P.Q.....6th Jan., 1866
D.L.S.

*Ellis, Henry Disney, Kuching, Sarawak,
Borneo .....7th April, 1877
D.L.S., Commr. of Pub. Works and Surveys.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Galbraith, John, Toronto,
School of Prac. Science.....13th April, 1875
M.A., D.L.S., Prof. Engineering. S.P.S.

Gibbons, James, Ottawa, Dept. of the Interior...15th April, 1890
Grad. S.P.S., Dominion Topographical Surveyor.

Gibson, George, St. Catharines.....10th April, 1860
D.L.S.

*Gilmour, Robert, Toronto, c/o Western
Loan Company.....11th April, 1856
D.L.S., C.E

Green, Thomas Daniel, Dawson City .....7th Jan. 1885
D.L.S.

Griffin, Albert Dyke,
Collegiate Institute, Woodstock.....11th Nov., 1890
B.A., Mathematical Master.

*Harris, John Walter, Winnipeg .....6th Oct., 1866
P.L.S. (Man.), D.L.S., Assessment Com.

Henderson, Eder Eli, Henderson P.O.,
Maine .....7th April, 1887
Grad. S.P.S.

Hermon, Ernest Bolton, Vancouver, B.C.....7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Innes, William Livingstone, Simcoe.....14th April, 1892
C.E. (Toronto Univ.).

Jephson, Richard Jermy, Calgary, Alta.....7th April, 1877
P.L.S. (B.C.), D.L.S.

Johnson, Sydney Munnings, Greenwood, B.C..9th Nov., 1895

Johnston, Robert Thornton,
New York, N.Y., 944 Amsterdam Ave.....9th April, 1889

Kains, Tom, Victoria, B.C.....11th July, 1873
D.L.S. P.L.S. (B.C.).

Kirk, John Albert, Rossland, B.C.....6th July, 1877
D.L.S., P.L.S. (B.C.)

*Kippax Hargreaves, Huron, South Dakota.....7th July, 1877
C.E. (Toronto Univ.), Assistant to Surveyor General.

*Klotz, Otto Julius, Ottawa, 437 Albert st.....6th Jan., 1876
C.E. (Mich. Univ.), Dominion Topographical Surveyor.

Lane, Andrew, Sparrow's Point, Md.....4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Lendrum, Robert Watt,
South Edmonton, Alta.....8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm,
Winnipeg, Man.....10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa,
340 Cooper st.....11th Oct., 1856
C.E., D.L.S.

McCulloch, Andrew, Lake Nelson, B.C.....
Grad. S.P.S., Assoc. Mem. Can. Soc. C.E., City Engineer,

*McMullen, William Ernest,, St. John, N.B..11th Nov., 1892
Asst. Eng. C. P. Ry.

Magrath, Charles Alexander, Lethbridge, Alta..1st Nov., 1881
B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).

Moore, Thos. Alexander, London South....12th Nov., 1892

Munro, John Vicar, New York, N.Y.,
359 West 31st st.....9th April, 1895

†Paterson, James, Allison, Lauzon, P.Q.....5th April, 1878
C.E., Mem, Can. Soc. C.E.

Pearce, William, Calgary, Alta.....12th Oct., 1872
D.L.S., P.L.S. (B.C.).

Ponton, Archibald William, Ottawa,
Dept. of Interior.....9th April, 1880
D.L.S.

Pope, Robert Tyndall,—— —— Ireland.....13th April, 1875
C.E., D.L.S.

Purvis, Frank, Mesa City, Arizona.....7th April, 1875

Reid, John Lestock, Prince Albert, Sask.....8th April, 1870
D.L.S.

Reiffenstein, James Henry, Ottawa,
Dept. of the Interior.....16th April, 1873
D.L.S.

Reilly, William Robinson, London,
361 Simcoe st.....7th April, 1881
D.L.S., P.L.S. (Man.)

Ritchie, Nelson Thomas, Kipiegan, Man.....9th Nov., 1888

Rogers, Richard Birdsall, Peterborough.....9th Jan., 1879
B.A.Sc. (McGill), D.L.S.

*Ross, Joseph Edmund, New Westminster,
B.C. .....11th Nov., 1890
P.L.S. (B.C.).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Sanderson, Daniel Leavens, Coral, Mich.....4th Oct., 1882

Shaw, Charles Æneas, Greenwood, B.C.....6th Oct., 1877
P.L.S. (B.C.).

Sherman, Ruyter Stinson, Vancouver, B.C..12th April, 1890
P.L.S. (B.C.).

Simpson, George Albert, Winnipeg Man.....7th Oct., 1864
C.E., D.L.S., M.P.

Spry, William, Toronto.....19th July, 1858
C.E., D.L.S.

*Stewart, Louis Beaufort, Toronto,
School of Prac. Science.....6th April, 1882
Dominion Topographical Surveyor, Lect. in Surveying.

Strathern, John, Vancouver, B.C.....5th Oct., 1876
P.L.S. (B.C.), D.L.S.

Tracey, Thomas Henry, Vancouver, B.C.....8th April, 1870
C.E., P.L.S. (B.C.), D.L.S.

Vicars, John Richard Odlum, Kamloops, B.C..5th Jan., 1887
D.L.S., P.L.S. (B.C.).

Wallace, Charles Hugh, 36 Dame St., Dublin, Ire., 9th Nov. 1889
C.E. (Trin. College, Dublin), Dom. Gov. Surveyor.

Weekes, Abel Seneca, Wetaskiwin, Alta....12th April, 1890
D.L.S.

Wheeler, Arthur Oliver, New Westminster,
B.C. .....8th July, 1881
P.L.S. (B.C.), D.L.S.

Willson, Alfred, Toronto, Can. Co. Offices,
Imperial Bank Chambers.....6th Oct., 1866
D.L.S., Commissioner Canada Company.

Wilkins, Frederick William, Ottawa,
Dept. of the Interior.....6th Jan., 1877
Dominion Topographical Surveyor.

SUMMARY.

Active members subject to dues.....	196
Active members exempted from dues	19
Withdrawn from practice (including 9 Associates)	69
Dead	34
Total number enrolled since incorporation.....	318

Deceased Members.

NAME.	LATE RESIDENCE.	DATE OF P. L. S. CERTIFICATE.	DATE OF O. L. S. REGISTRATION	DIED.
Bolger, Francis	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bolger, Thomas Oliver	Kingston	6th July, 1865	1892	——— ———
Bowman, Leander Meyer	Toronto	14th April, 1892	1892	20th September, 1895.
Brown, David Rose	Cornwall	10th October, 1850	1892	14th May, 1900.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1897.
Caddy, Edward C.	Cobourg	18th December, 1846	1892	26th September, 1897.
Coad, Richard	Glencoe	8th October, 1879	1892	17th May, 1897.
Creswicke, Henry	Barrie	8th July, 1864	1892	22nd January, 1898.
Cromwell, Joseph M. O.	Perth	1st October, 1846	1892	19th October, 1897.
Davidson, Walter Stanley	Sarnia	9th April. 1884	1892	December, 1900
Deane, Michael	Windsor	26th May, 1848	19th December, 1892	3rd April, 1897.
DeGurse, Joseph	Windsor	5th April, 1883	1892	22nd March, 1898.
FitzGerald, James William	Peterborough	13th July, 1857	1892	————, 1901.
Foster, Frederick Lucas	Toronto	9th April, 1863	1892	27th July, 1899.
Fowlie, Albert	Orillia	13th January, 1863	1892	—— April, 1898.
Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Gilliland, Thomas Brown	Eugenia	11th July, 1868	25th January, 1890	14th December, 1898.
Haskins William	Hamilton	5th July, 1855	1892	5th July, 1896.
Hewson, Thomas Ringwood	Hamilton	6th July, 1877	1892	21st October, 1898.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896
Kirk, Joseph Green	Stratford	16th February, 1843	1892	22nd January, 1900.
Lynch-Staunton, Francis H.	Hamilton	11th October, 1856	1892	11th June, 1899.
MacMillan, James Alexander	Calgary	6th January, 1877	24th December, 1894	—— ———, 1898.
MacNab, John Chisholm	Hamilton	8th January, 1880	1892	16th October, 1897.
McCallum, James	Fort Francis	30th March, 1849	1892	—— July, 1900.
Malcolm, Sherman Morgan	Blenheim	11th October, 1858	1892	13th January, 1899.
Ogilvie, John Henry	Rat Portage	8th April, 1876	24th April, 1894	21st September, 1898.
Pedder, James Robert	Doon	10th November, 1891	23rd December, 1892	17th January, 1897.
Reid, James Hales	Bowmanville	6th October, 1866	1892	22nd December, 1899.
Robinson, William	London	—— May, 1846	1892	11th October, 1894.
Tiernan, Joseph Martin	Tilbury Centre	7th January, 1886	1892	December, 1900
Thomson, Augustus Clifford	Chicago	14th January, 1861	1892	—— December, 1896.
Walsh, Thomas William	Simcoe	25th April, 1842	1892	14th March, 1895.
Wheelock, Charles John	Orangeville	——— ———, 1856	1892	4th July, 1897.

EXTRACTS FROM THE

BY-LAWS AND STATUTES

RELATING TO THE

ADMISSION AND EXAMINATION OF

Ontario Land Surveyors.

BY-LAWS.

EXAMINATIONS.

Examination of candidates for apprenticeship.

28. Candidates for admission to apprenticeship are to be examined as follows, in the subjects prescribed in Rev. Stat. Ont., c. 180, s. 22; and no candidate shall be admitted unless he obtains at least the minimum marks set opposite each subject, and at least a total of 550.

Subject.	Max. Marks.	Min. Marks.
1. Penmanship	50	30
2. (*a*) Orthography (including dictation)	50	40
(*b*) English Grammar	50	25
3. Arithmetic (Fractions, Decimals, Square Root)	100	60
4. Logarithms and Algebra (including Equations 1st Degree)	100	60
5. Euclid (Books 1, 2, 3 and 4)	100	60
6. Plane Trigonometry and Rules for Spherical	100	50
7. Mensuration of Superficies	50	30
8. Linear Drawing (use of ruling pen and construction of scales)	50	25
9. Canadian and General Geography	50	25
10. Canadian History	50	25

Examination of candidates for admission to practice.

29. Candidates for admission to practice are to be examined as follows in the subjects prescribed in Rev. Stat. Ont, c. 180, s. 25; and no candidate will be admitted unless he obtains at least the minimum marks set opposite each subject, and at least a total of 1,000.

Subject.	Max. Marks.	Min. Marks.
1. Geometry, including the first 6 books of Euclid, excepting the last thirteen propositions of the fifth book	100	50
2. Algebra (simple and Quadratic Equations, Progressions and Exponents)	100	50
3. Trigonometry (Plane and Spherical)	100	60
4. Mensuration of superficies and laying out and dividing land	150	75
5. Descriptions by metes and bounds	100	75

	Subject.	Max. Marks.	Min. Marks.
6.	Use and Adjustment of Instruments for surveying and levelling	100	70
7.	Laying out of Curves	50	30
8.	Practical Astronomy, including finding of Time, Latitude, Longitude, Azimuth, Variation of Compass, and drawing Meridian Lines	150	90
9.	Survey Act	150	90
10.	Mines Act, Registry Act, Municipal Act, (so far as they relate to surveys and drainage), Ditches and Water-courses Act	100	50
11.	Levelling	50	35
12.	Principles of Evidence and drawing up Affidavits	80	40
13.	Taking of Field notes and preparing of Plans	100	60
14.	Geology and Mineralogy, (rudiments of)	75	40
15.	Elementary Botany and the Forest Flora of Canada	50	25

30. If a candidate for admission to practice obtains at least the total of 1,000 marks, but fails to obtain the minimum marks in, at least, two of the subjects, such candidate may at a subsequent exmination be examined only in the two subjects in which he has failed.

Chapter 180, R.S.O. 1897.

(An Act respecting Land Surveyors,)

* * * * * * *

Meetings when and where to be held.

20. The said Board shall meet at the office of the Commissioner of Crown Lands, on the second Monday in the month of February, in every year, unless such Monday be a holiday (in which case they shall meet on the day next thereafter not being a holiday), and may adjourn such meeting from time to time if they deem it necessary. R.S.O. 1887, c. 152, s. 6. 60 V. c. 27, s. 1.

* * * * * * *

APPRENTICES.

Qualification for admission as an apprentice, and examination of applicant.

22. No person shall be admitted as an apprentice with any Ontario Land Surveyor unless he has previously passed an examination to the satisfaction of the Board of Examiners, in penmanship, orthography, English gram-

mar, arithmetic, algebra (including square-root logarithms and quadratic equations), Euclid (first four books and deductions), plane trigonometry, spherical trigonometry as far as and including the solution of right-angled triangles, mensuration, practical geometry (including the use of ruling-pen and the construction of plane and comparative scales), Canadian and general geography and Canadian history, and has obtained a certificate of such examination and of his proficiency from the Board. 60 V. c. 27, s. 2.

Examination and Certificate Fees.

23. Every applicant shall before being so examined pay to the Secretary-Treasurer of the Association the fees chargeable as hereinafter provided for the said examination and certificate. R.S.O. 1887, c. 152, s. 8.

Notice to be given by Applicants.

24. Applicants for examination previous to apprenticeship shall give one month's notice to the Secretary of the Board of their intention to present themselves for examination, and shall pay to the said Secretary the fee for receiving and entering such notice. R.S.O. 1887, c. 152, s. 9.

QUALIFICATION FOR ADMISSION TO PRACTISE.

Qualification for Admission to Practise.

25. Except as hereinafter provided no person shall be admitted to practise as a land surveyor in and for Ontario until he has attained the full age of 21 years, and has passed an examination before the Board of Examiners in the following subjects, viz., geometry, including the first six books of Euclid (with the exception of the last thirteen propositions of the fifth book), algebra, including progressions, plane and spherical trigonometry, mensuration of superficies, laying out and dividing of land, descriptions by metes and bounds for deeds and other documents, the use and adjustment of surveying and levelling instruments, the laying out of curves, practical astronomy, including finding of time, latitude, longitude, azimuth, variation of the compass, and drawing meridian lines, the Acts relating to the survey of lands in Ontario,

Rev. Stats. cc. 36, 136; cc. 226, 285.

The Mines Act, The Registry Act, so far as it refers to plans, the Municipal Acts, so far as they relate to roads, surveys and drainage, *The Drainage Act, The Ditches and Watercourses Act,* the theory and practice of levelling, the principles of evidence, drawing of affidavits, taking of field notes and preparing plans, the rudiments of geology and mineralogy, elementary botany and the forest flora of Canada, and the sufficiency of his surveying instruments, and has served regularly and faithfully, for three

Apprenticeship.

successive years, except as is in this section hereinafter provided, under an instrument in writing duly executed before two witnesses, as apprentice to an Ontario Land Surveyor, duly admitted and practising therein as such, nor until he has received from the said land surveyor a certificate of his having so served during the said period, or proves to the satisfaction of the Board that he has so served. R.S.O. 1887, c. 152, s. 10. 60 V. c. 27, s. 3.

Attendance of Apprentice at School of Practical Science or Institution with Similar Course of Study.

26. Any person serving as an apprentice as hereinbefore provided, may, with the permission of the Board of Examiners attend the Ontario School of Practical Science, or any school, college, or university, the course of study in which is, in the opinion of the Board sufficiently similar to that in the Ontario School of Practical Science, for the purpose of taking any course of study which includes any subjects required for the final examination for admission to practise as a land surveyor, but the total period of such apprenticeship and of such course of study shall not exceed the period of four years from the date of the articles of apprenticeship as above mentioned, and not less than three years of the said period of four years shall be passed in the actual service of a practising Ontario Land Surveyor. 60 V. c. 27, s. 4.

Persons qualified in other British Dominions may be admitted to Practise in Ontario.

27. In case a person who has attained the full age of 21 years and who has been practising as a land surveyor in any of His Majesty's dominions other than this Province, shall satisfy the Board of Examiners that the qualifications for practising required of such person in the said dominion, were sufficiently similar to those required in this Province, and shall produce to the said Board his diplomas or certificates, such persons shall not be required to serve as an apprentice, or shall only be required

to serve during such period not exceeding three years as the said Board may consider requisite, after which such person shall, on complying with the other requirements of this Act, have the right to undergo the final examination, or such portions thereof as the said Board may consider necessary, and shall, if found qualified, practise as a land Surveyor in Ontario. 60 V. c. 27, s. 6.

Graduates of Royal Military College, Kingston, or of Ontario School of Practical Science, and McGill College, Montreal, to have certain privileges.

28. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Royal Military College at Kingston, or of the Ontario School of Practical Science, in civil engineering or in mining engineering, or of the McGill College, Montreal, in civil engineering or in mining engineering, and such person shall not be required to pass the preliminary examination herein before required for admission to apprenticeship with a land surveyor, but shall only be bound to serve under articles with a practising land surveyor, duly filed as required by section 32 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination prescribed by this Act. R.S.O. 1887, c. 152, s. 14. 60 V. c. 27, s. 7 (1).

Attendance at certain Schools during apprenticeship.

29. Such person at any time during his apprenticeship may, with the permission of the Board of Examiners, attend the Ontario School of Practical Science, or any school, college, or university, the course of study in which is, in the opinion of the Board, sufficiently similar to that in the Ontario School of Practical Science, for the purpose of taking any course of study which includes any subjects required for the final examination for admission to practise as a land surveyor, but the total period of such apprenticeship, and of such course of study, shall not exceed the period of two years from the date of the articles of apprenticeship as above mentioned, and not less than twelve months of the said period of two years shall be passed in the actual service of a practising Ontario Land Surveyor. 60 V. c. 27, s. 7 (2).

If Surveyor dies, etc., service may be completed with another Surveyor.

30. If a surveyor dies or leaves the Province, or is suspended or dismissed, or ceases to practise, his apprentice may complete his term of apprenticeship, under an instrument in writing as aforesaid, with any registered

surveyor in actual practice. R. S. O. 1887, c. 152, s. 15. 60 V. c. 27. s. 8.

Instruments of Apprenticeship may be transferred.

31. A surveyor may, by an instrument in writing, transfer an apprentice, with his own consent, to another registered surveyor in actual practice, with whom he may serve the remainder of the term of his apprenticeship. R.S.O. 1887, c. 152, s. 16. 60 V. c. 27, s. 9.

Instruments binding to Service to be filed, etc.

32. No instrument in writing under which an applicant for admission to practise as a surveyor claims to have served with some practising surveyor for the required period shall avail to authorize the admission of an applicant, unless the instrument has been transmitted to the Secretary of the Board within two months next after the date thereof, nor unless the fee in respect thereof mentioned in section 39 of this Act was by the apprentice paid to the Secretary of the Board at the time of transmitting the indenture or articles; and the said Secretary shall acknowledge by post the receipt of all such instruments or copies thereof transmitted to him, and shall carefully keep the same filed in his office. R. S. O. 1887, c. 152, s. 17. 60 V. c. 27, s. 10.

ADMISSION OF CANDIDATES.

Notice of examination to be given by candidates for admission.

33. Every person desiring to be examined by the Board as to his quailfication to be admitted as a land surveyor, shall give notice thereof in writing to the Secretary of the Board, at least one month previous to the meeting thereof. R. S. O. 1887, c. 152, s. 18.

The Board to require certificates of good conduct, etc.

34. Every person applying for admission to practise as a land surveyor shall produce to the Board satisfactory certificates as to character for probity and sobriety, and before a certificate is granted shall perform such practical operations in the presence of the Board, and shall answer such questions on oath (which oath any member of the Board may administer) with regard to the actual practice of such applicant in the field, and with regard to his surveying instruments, as the said Board may require. R.S.O. 1887, c. 152, s. 19.

* * * * * * *

FEES.

39. The following fees shall be paid to the Secretary-Treasurer for the use of the association : Tariff of fees.

1. By every person duly authorized to practise as a land surveyor under the provisions of this Act on applying for registration under this Act, the sum of $1.00.

2. By each member of this association an annual membership fee of $4.00.

3. By each apprentice at the transmitting to the secretary the indenture or articles of such apprenticeship, $10.00; 62 Vic. 2., c. 11, s. 18.

4. By each candidate for examination, with his notice thereof, for receiving and entering such notice, $1;

5. By each applicant obtaining a certificate, as a fee thereon, $2;

6. By each applicant receiving a certificate to practise, as an admission fee, $30;

7. By each apprentice with each transfer of articles as a fee for registering same, $2;

8. By each applicant receiving a certificate to practise, being the fee for official notice in the *Ontario Gazette*, $.

55 V. c. 34, s. 7; 69 V. c. 27, s. 26.

No. 17.

ANNUAL REPORT

OF THE

ASSOCIATION

OF

ONTARIO LAND SURVEYORS

ORGANIZED 1886. INCORPORATED, 1892.

AND

PROCEEDINGS

AT THE

TENTH ANNUAL MEETING

SINCE INCORPORATION

HELD AT

TORONTO.

MARCH 18th, 19th and 20th, 1902

PRINTED FOR THE ASSOCIATION BY
HENDERSON & CO., LOMBARD ST.
TORONTO,

PATRONIZE OUR ADVERTISERS.

NOTICES.

Members and others will be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, or 1901, upon remitting to the Secretary fifty cents for each copy required.

Copies of the "Manual" may also be had from the Secretary, price fifty cents.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme is most desirable, and to insure its preparation it is not now too early to bear the matter in mind.

In addition to its use as a library, the Repository now serves as a drafting room for members when copying Crown Lands plans and notes.

Published annually by the Association of Ontario Land Surveyors. Edition, 1350 copies; price, 50 cents.

PATRONIZE OUR ADVERTISERS.

PREFACE.

To the Members of the Association of Ontario Land Surveyors :

The Proceedings of the Association at its Tenth Annual Meeting are herewith presented.

Respectfully submitted on behalf of the Council,

KILLALY GAMBLE,

Secretary.

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ASSOCIATION OF
ONTARIO LAND SURVEYORS

(ORGANIZED, 1886. INCORPORATED, 1892.)

OFFICERS FOR 1902-1903.

PRESIDENT.

W. R. Aylsworth - - - - - - - - - Belleville.

VICE-PRESIDENT,

C. A. Jones - - - - - - - - - - Petrolea.

CHAIRMAN OF COUNCIL.

Villiers Sankey - - - - - - - - Toronto.

SECRETARY-TREASURER.

Killaly Gamble - - - - - - - - - Toronto.

MEMBERS OF COUNCIL.

Hon. E. J. Davis, - - - - Commissioner of Crown Lands.

G. B. Kirkpatrick, Toronto.
Villiers Sankey, Toronto. } For Term ending April, 1905.

J, W. Tyrrell, Hamilton,
J. McAree, Rat Portage. } For Term ending April, 1904.

Alex. Niven, Haliburton.
A. J. Van Nostrand, Toronto. } For Term ending April 1903.

AUDITORS.

H. J. Browne - - - - - - - - - Toronto.
J. F. Whitson . - - - - - - - - Toronto.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch), Toronto.

BOARD OF EXAMINERS.

VILLIERS SANKEY, (Chairman).

G. B. KIRKPATRICK, Toronto. M.J. BUTLER, Charlottetown, P.E.I.	For three years.
P. S. GIBSON, Willowdale. ALEX. NIVEN, Haliburton.	For two years.
M. GAVILLER, Collingwood. B. J. SAUNDERS, Regina, Assa.	For one year.

NOTE—Board meets at Crown Lands Department, Parliament Buildings, Toronto, on Monday, 9th February, 1903.

COMMITTEES, 1902-1903.

STANDING.

LAND SURVEYING — J. D. Evans, (Chairman), Ed. Bazett, James Dickson, Wm. Galbraith, H. H. Gibson, C. J. Murphy, A. L. Russell, E. T. Wilkie.

DRAINAGE—M. Gaviller, (Chairman), F. W. Farncomb, C. A. Jones, J. B. Lewis, J. H. Moore, Wm. Newman, Geo. Ross.

ENGINEERING—P. S. Gibson, (Chairman), E. G. Barrow, J. Hutcheon, R. W. DeMorest, F. F. Miller, Owen McKay, J. G. Sing, J. A. Wilde.

ENTERTAINMENT—A. J. Van Nostrand, (Chairman), Willis Chipman, H. L. Esten, K. Gamble, H. H. Gibson, V. Sankey, H. DeQ. Sewell.

PUBLICATION—A. J. Van Nostrand, (Chairman), H. J. Browne, H. L. Esten, K. Gamble, W. A. McLean.

TOPOGRAPHICAL SURVEY—Otto J. Klotz, (Chairman), Willis Chipman, T. Fawcett, J. McAree, J. L. Morris, L. B. Stewart, T. B. Speight.

SPECIAL.

LEGISLATION—Villiers Sankey, (Chairman), W. R. Aylsworth, H. J. Browne, P. S. Gibson, C. A. Jones, G. B. Kirkpatrick.

POLAR RESEARCH—Willis Chipman, (Chairman), Jos. Cozens, C. J. Murphy, Wm. Ogilvie, L. B. Stewart, J. W. Tyrrell, J. F. Whitson.

EXPLORATION—T. B. Speight, (Chairman), J. McAree, A. Niven, J. Robertson, L. V. Rorke, G. Silvester, H. W. Selby.

REPOSITORY AND BIOGRAPHY—H. L. Esten, (Chairman), Willis Chipman, R. P. Fairbairn, K. Gamble, P. S. Gibson, T. H. Jones, G. B. Kirkpatrick, C. Unwin, A. J. Van Nostrand.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED.)

AT ITS TENTH ANNUAL MEETING HELD AT TORONTO, MARCH 18, 19 and 20, 1902.

PROGRAMME.

Tuesday, March 18th—Morning, 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committees.

Afternoon, 2 o'clock.

President's Address.
Report of Secretary-Treasurer.
Paper—"Use of Concrete for Small Culverts and Bridges on Country Roads." A. W. Campbell, Dep. Minister of Public Works.
Report of Committee on Repository and Biography. A. J. Van Nostrand, Chairman.

Evening, 8 o'clock.

(AT REPOSITORY.)

Report of Committee on Publication. K. Gamble, Chairman.
Paper—"Northern Exploration of Ontario." G. B. Kirkpatrick.
Report—Polar Research Committee. Willis Chipman, Chairman.

Wednesday, March 19th—Morning, 10 o'clock.

AT ENGINEERS' CLUB ROOMS, 94 AND 96 KING ST. WEST.

Report of Council. G. B. Kirkpatrick, Chairman.
Paper—"North-West Angle, Lake-of-the-Woods." Otto J. Klotz.
Report of Land Surveying Committee and Question Drawer. J. D. Evans, Chairman.
Paper—"Mine Surveying, Underground Surveys and Plans." DeMorest and Silvester.
Report—Engineering Committee. E. G. Barrow, Chairman.

Afternoon, 2 o'clock.

Paper—"The Drainage Acts, Their Uses and Abuses." M. Gaviller.
Report of Drainage Committee and Question Drawer." C. A. Jones, Chairman.

Evening, 8 o'clock.

Annual Dinner, McConkey's Restaurant.

Thursday, March 20th—Morning, 10 o'clock.

At the Repository, Parliament Buildings.

Report of Topographical Survey Committee. L. B. Stewart, Chairman.
Paper—"Plans for Assessors." P. S. Gibson.
Paper—"Irrigation Work." B. J. Saunders.
Paper—"Transportation." H. DeQ. Sewell.
Report of Committee on Entertainment. A. P. Walker, Chairman.

Afternoon, 2 o'clock.

Nomination of Officers—President, Vice-President, Secretary-Treasurer, Auditors, two members of Council.
Ratification of By-laws.
Unfinished Business.
New Business.
Adjournment.

Minutes of the Ninth Annual Meeting

OF THE

ASSOCIATION OF

ONTARIO LAND SURVEYORS

HELD AT THE REPOSITORY, PARLIAMENT BUILDINGS,

AND AT

THE ENGINEERS' CLUB ROOMS, 94 AND 96 KING STREET EAST, TORONTO,

ON MARCH 18TH, 19TH AND 20TH.

AFTERNOON SESSION.

In the Repository, Parliament Buildings, Toronto, on Tuesday, 18th March, 1902, at 2 o'clock p.m.

Mr. James Dickson, the President, called the meeting to order.

The President announced the reading of a paper by Mr. Archibald W. Campbell, Deputy Commissioner of Public Works.

Mr. Campbell—I announced the subject of my paper some little time ago to Mr. Sankey, but I have been away a good deal for the last two or three weeks, and really had forgotten all about it till this morning. However, I have put something in shape, it is being typewritten at present, and I will hand the paper in a little later. It will be sufficient for me now to say that I find there is a growing demand for the use of concrete in building small culverts, sluices and bridge abutments, and it is almost a necessity in the average municipality because other material is becoming very scarce and expensive, and even at best we get a very inferior quality, and what we do get is constantly rotting out and repairs are necessary. Unfortunately, municipal councils undertake the building of bridge abutments and concrete arches and pipes for small culverts without having that knowledge of the treatment of concrete which is essential to good work. They don't really understand the very great im-

portance of carefully selecting clean gravel or clean sand and broken stone, and mixing these materials in the proper proportions, using just a certain amount of water and using that carefully in order to get the proper results. You all understand how very important these matters are, even in making concrete pipes from twelve inches up to three feet in diameter for use in the average sluice; it is of the very greatest importance, in order to make good pipes, that we should select clean gravel; and in selecting clean gravel we should see that the same proportions of stone and sand compose that gravel. Very often we find that in the average gravel pit certain pockets are almost entirely filled with clean stone, while the greater portion of the material to be found in the gravel pit has more sand and earthy matter in it than real stone; and wherever earthy matter exists, a poor concrete is the result, because the cement will not unite properly with earthy or dirty sand. In manufacturing concrete pipes—something I think that should be urged by all of you in your respective communities—is making these pipes for small culverts locally. The moulds can be produced at any regular foundry, and it is a simple process so long as the people understand the mixing of the concrete. Pipes can be made in the fall of the year and allowed to remain standing outside during the winter months, and this tends to mature them and harden them, and it places them in first-class condition for use the following spring.

In making large concrete arches we often find that there is great carelessness; municipal councils undertake this work without having carefully prepared plans and specifications, and I know of several cases where culverts costing all the way from eight to eighteen hundred dollars, have simply proved failures because they did not provide proper plans and specifications and careful, practical, or skilled supervision. In every possible way I am trying to urge upon the municipalities the importance of this, and I wish that you would, as far as you possibly can, insist upon their having these plans and specifications properly prepared and the work placed in the hands of some person who will give it careful attention and who understands something about mixing and preparing the concrete before this work is undertaken. Concrete arches in this way can be built up safely to a diameter of ten feet in span, on a barrel of ten feet in diameter. But in building culverts of those dimensions it is a very intricate problem to figure out just

what the strength of the wall should be at the respective bearings, especially if these culverts are to carry a very great load of earth. To proportion the culverts properly seems a very simple problem, but at the same time it requires a great deal of mathematical calculation. The best design, of course, is to make the inside lines of the wall vertical, springing the arch from those in the true line; the batter is given entirely from the outside. The apex of the arch is usually made the weakest or the thinnest part of the whole, because at this point is the least bearing. But at the shoulders, that is, where the arch springs or leaves the wall, is usually the weak point, and it is at this particular point that great care must be exercised in seeing that sufficient strength is given. From this point, of course, all the batter is given to the foot of the wall. This point, as a general thing, should be proportioned to the height of the wall and should be regular, because the thrust or bearing or strain on the wall from the union of the tangent with the arc is proportionate to the load that is being carried by them as a direct pressure and as a thrust. In building these culverts on a weak foundation much care must be taken. If it is on a very boggy soil or quicksand, then I believe in driving piles to make a foundation and cutting them off a sufficient depth below the water line or the line of moisture, and laying a complete floor of concrete of about six inches in thickness over the whole area, including the area of the floor of the culvert exposed. In soft clays or sand that is not extremely suitable, it is well to put on a wide footing; this is usually made twelve inches in thickness. The paper which I am preparing gives a diagram of a ten-foot arch culvert and gives the calculation for the different thicknesses of wall I have specified. This may be of some service to those who have not had much experience in this line. The dimensions of the walls and arch are usually proportioned to the diameter of the culvert.

The question is often asked, as to whether concrete or stone is the most serviceable for bridge piers and abutments. I believe that with a first-class quality of concrete or a first-class quality of stone they are equally durable and equally serviceable; and I think that where stone is easily available it is well to use stone for piers and abutments, but where stone is not plentiful and has to be shipped or loaded on cars to be transported any considerable distance, and gravel or broken stone—field stone that can be crushed—is to be found near, I would

use concrete. The concrete can be placed in position, where the material, stone or gravel, can be procured within two miles of the work, for about $5.50 a cubic yard. Stone shipped or that has to be handled by train usually costs from $7.00 to $7.50 per yard. I do not think the difference in cost is in favor of stone, because when the concrete is carefully laid it makes just as serviceable and as durable a job; and the availability of the material is really about the one thing that would govern me in determining which should be used. The feeling now is in favor of using material in bridges and culverts that is not perishable; where stone or concrete is used in piers and abutments or for the sub-structure, and steel is used and kept painted and given proper attention, for the super-structure, there is nothing connected with it that is perishable or will require renewal, excepting the plank of the flooring. Timber for this purpose, of course, is not being used in the larger works in cities and in the older parts of the Province, but steel girders or steel joists with a lattice between is being used, and vitrified brick or concrete used as a flooring. The lattice-work simply supports the concrete and the concrete then is mixed up in the same proportion as it is mixed for sidewalks or for street-crossing purposes and is laid on usually to a depth of four inches, with a small crown on the centre to drain the water into grooves; and of course the camber of the bridge is sufficient to discharge the water to either end, where a small gutter is made in the concrete and the water is disposed of laterally. This flooring is ribbed again, or grooved, as concrete crossings on the street are ribbed and grooved, to provide a footing for the horses, and also to assist in shedding the water. Where concrete is used for this purpose it is necessary, of course, to make it a little stronger than in either culvert pipes or bridge foundations; we usually provide for the concrete a strength of one of first-class Portland cement to one and a half of sand and about three of crushed stone or clean gravel. It is put on to a depth, as I said before, of about four inches. Experience has proved that this material will stand with the design of joists and lattice-work which is provided now by bridge companies. Provision is made —by joining, by cutting the concrete over the joists and filling that with sand—to resist the action of the weather and contraction and expansion; and in no case do we find that this material suffers from exposure to frost or from contact with the wheels or with the horses' feet. One bridge that I recall at the present

time that was floored in this way two years ago, is 414 feet long, and it has passed through two winters successfully. I visited one piece of work last week in the city of Ottawa, where this flooring has been used for seven years. In some of the works in the United States, some of the bridges there that I have visited, the concrete has been used as a flooring for twenty-seven years. I do not think there is any objection to use concrete for this purpose; and certainly it is economical. Plank now at $22 a thousand, costs about seven cents per square foot for a bridge flooring. The concrete, even including the lattice for supporting it, can be laid down for twelve cents per square foot, so that the cost of the concrete is less than double the cost of the plank, and the life of the plank is not more than eight years, while the life of the concrete we may say, so far as our experience has gone, is infinitely more.

I simply bring these points to your attention as being the points covered by the paper which I will present for publication. I am sorry my paper is not here for your discussion, but I have tried to go over the ground roughly so as to bring on a proper discussion. (Applause.)

The President—There are certainly some very interesting things brought out by Mr. Campbell, and I will be glad to hear any opinions as to them.

Mr. Aylesworth—I have been connected with the County Council of Hastings for thirty years, and when I was a member of it about twenty years ago, we then had county bridges and a system of county roads; all our bridges were wooden bridges except two stone bridges built on arches. I introduced a resolution, that, where at all practicable, our bridges should be upon concrete or stone foundations and steel structures. The motion raised considerable discussion a that time in the County Council; timber was then much cheaper and more plentiful in that county than it is at present; but the motion prevailed, and to a large extent in that county we have adopted this, with the result that the expenditure on bridges per year in the county now is only about one-third of what it was at that time when we had wooden bridges. We have some seventeen or eighteen steel bridges upon stone abutments and piers, and whenever we have to build a bridge of any considerable size we will now build it of steel. We have not as yet in the county, nor in the city of Belleville a flooring of concrete; it has been talked about,

but we use five-inch cedar for flooring, and pay $15.50 per thousand feet board measure for it. This winter we are getting it for $12, delivered at a convenient place. In using five-inch cedar flooring we don't make both ends of the piece the same size, but allow it to taper to the butt and top, and then bring the ends so that they are even. This flooring gives satisfaction.

I am glad to hear Mr. Campbell's remarks on the question of concrete culverts. I have asked our superintendent of gravel roads to have them made, and we have had several abutments and piers built of concrete and they are standing well, and are giving entire satisfaction; but we have not yet introduced the concrete into culverts, of which we have a very great many. I am sure as soon as they get the idea of making them, and making them properly, and placing them as they should be, a very great saving will be effected to the county. We are still building them of various kinds of stone and timber, and it is much more expensive than it would be if they were carefully constructed with concrete. I am very much pleased with the remarks of Mr. Campbell.

Mr. Van Nostrand—I think it has been ruled out of order to present votes of thanks to authors of papers, so we had better not attempt it now, but it is quite in order to move that this paper be received and printed in the proceedings. I am sure that we all feel grateful to Mr. Campbell for the paper he has written, and it will be as interesting and valuable to the members of our Association as any paper we have before us, for while it is not exactly "land surveying," we are following the rules by providing for the wants of our members.

I move that the paper be received and printed in the proceedings.

Mr. H. H. Gibson—I take very great pleasure in seconding this motion. In the Township of York we have many opportunities of using concrete, but we have used very little of it so far. We have under construction the building of a large culvert, and we thought of putting in brick; but now that this paper has been presented to us and large culverts have been spoken of particularly in it, this matter will be re-considered. We have also under consideration and are receiving tenders for a steel bridge, and we had intended building it upon cylinder piers, which are common foundations throughout the country now-a-days; they are erected by driving piles down through steel

cylinders and filling them up with concrete in many cases, but the bridge companies to whom we sent notices for tenders are so busy with other work at the present time that they asked us not to ask them to put in these foundations, but rather to let them tender only for the super-structure. This will give us another opportunity of doing the work by putting in concrete foundations, which I believe is the very best method for us to adopt in the township, as we have got to bring stone by the cars from a great distance in order to put in proper abutments, as we have done in some of the large bridges that we have built.

I believe this paper is a very valuable one and right up-to-date, and one that I will take very much pleasure in reading and studying and acting on in the Township of York around Toronto.

President Dickson—I feel that this paper should be received and printed; the time has come when land surveyors should take into serious consideration the making of roads. The day has passed when we could be fully occupied with side-lines; we must turn our attention to other branches of the profession. It is advantageous to have this subject so well brought before the meeting.

President Dickson put the motion, and, on a vote having been taken, declared it carried.

Mr. Campbell—I am sure I thank you. I ask to be excused just now, but I hope and expect to be with you to-morrow.

President Dickson read his Address.

The President's address was received with applause.

Mr. Aylesworth—I move that the address of our President be received and published in the minutes.

Mr. H. H. Gibson—I have very much pleasure in seconding this motion. Carried.

Mr. A. J. Van Nostrand read the report of the Repository and Biography Committee and moved its adoption.

Evening Session.

Tuesday, 18th March, 1902, 8 o'clock p.m.

President Dickson in the chair, called the meeting to order.

Captain Gamble read the report of the Committee on Publication.

Vice-President Aylesworth moved that the report be received and adopted.

Mr. E. G. Barrow seconded the motion. Carried.

Mr. Kirkpatrick here read his paper on "Exploration in Ontario in 1900." (Applause.)

Mr. C. A. Jones—I have very much pleasure in moving a hearty vote of thanks for the excellent and very intelligent paper by Mr. Kirkpatrick, and I think we are greatly indebted to him for the pains he has taken and the time he has given to procure so much information as he has given us in the paper he has just read. I think we can scarcely appreciate it sufficiently. I am sure it is quite a revelation to me.

Mr. Selby (Dinorwic)—Mr. Chairman and Gentlemen, as an Ontario Land Surveyor from Northern Ontario, I have much pleasure in seconding the motion. I can join with Mr. Jones in saying that I think that Mr. Kirkpatrick has gone to a great deal of trouble. He has not over-estimated nor colored the matter in any shape or form, and I think the Eastern Ontario men ought to know the heritage they have there. I do not think they appreciate it nearly enough. I have lived there now for seven years, and I am beginning to see what a grand country Ontario has got there. I think, as Mr. Kirkpatrick said, that in ten years they will see it in a great deal better light.

The President put the motion, and, on a vote having been taken, declared it carried, and tendered the thanks of the Association to Mr. Kirkpatrick.

Mr. Kirkpatrick—I only wish that my paper had been a little more explicit. If I had had the time, I could have gone on further, because it is a subject that is very close to my heart; as a good many of you know, I have done all I can to help surveyors in the past and I hope to do it in the future. When

I talk about helping surveyors, I include in that everybody in the Province as well, because I maintain that Ontario is a name to conjure by. When I was home in 1900 I found that it was a good deal to be a Canadian, and whenever I have been home I have found that the name "Canadian" was sufficient to pass you into almost any place. I was at the House of Commons once when nobody was allowed in, and I was stopped by a big policeman, but one of the officers of the House was passing and heard me say I was a Canadian; he turned to me and said, "Come right in." And he took me right in, and pointed me out Mr. Gladstone's seat and all the different seats; and he could not do enough for me. I went to the Tower one day, and I found a lot of people there wanting to get in, and I was told "It is not the day, you can't get in." I said, "I am a Canadian and I can't come another day." The answer I got was, "Oh! come in." I was shown everywhere, and the greatest courtesy manifested. I need not say that the name of Ontario or the name of Canada has grown much in favor since then—they all know what the Canadian contingents did in South Africa. You all know how the Canadian troops were received in London, and you all know how the Canadian troops conducted themselves in the campaign in South Africa, where every one of them covered himself with glory. You see, I am not far wrong in saying that Canada is the brightest jewel in the Empire on which the sun never sets (hear, hear), and I think you will all agree with me that Ontario is the brightest star in the Dominion.

I am obliged to you for your kindness. (Applause.)

Mr. Barrow read the report re Engineers' Association.

Mr. Chipman—I am of opinion that the discussion had better be adjourned till to-morrow forenoon, when in the order of business, as stated in our program, it will come up, and the Engineers may come purposely to discuss this Bill we are discussing now.

Major Sankey—The discussion came up to-night because Mr. Barrow, who is Chairman of our Engineering Committee, said he could not be here to-morrow. I have no objection to it being held over.

President Dickson—You mean you would not close the discussion now.

Mr. Chipman—I think it would be better to leave it over till to-morrow.

President Dickson—I agree with you; I think we should have the fullest possible meeting to discuss it.

Mr. J. A. Van Nostrand moved, seconded by Mr. L. Bolton, that the discussion be postponed until to-morrow forenoon, at the Engineers' Club.

Mr. Willis Chipman here read the Report on "Polar Research."

Mr. Chipman moved, seconded by Mr. Aylesworth, that the report be adopted. Carried.

Mr. Chipman—We could not get our Committee together; one member of the Committee, Mr. Ogilvie, we could not find at all; letters sent to him were returned to me.

Major Sankey—Mr. Ogilvie is in California somewhere, but I don't know his address.

Mr. Chipman—My letters to him were returned to me.

Captain Bernier wrote to me stating that he was endeavoring to secure additional funds for his trip. I sincerely hope, and the other members of the Committee hope, that a member of the Land Surveyors' Association will volunteer to accompany Captain Bernier as a partner with him in this enterprise; I believe it would be a splendid advertisement for Canada if Canadians carry out an expedition of this kind.

President Dickson—I think it is the unanimous feeling of the Association that some member should volunteer.

Mr. Chipman—No one as yet has volunteered. Our intention was to have had Captain Bernier to lecture at Massey Hall here on the subject.

Ten o'clock p.m., adjourned to Wednesday, 19th March, at 10 o'clock a.m., at the Engineers' Club.

Morning Session.

Wednesday, March 19th, 1902, 10 a.m.

The Convention resumed its sessions at the rooms of the Engineers' Club, 94 King St. West, Toronto, with the President, Mr. Dickson, in the chair; Major Villiers Sankey, Secretary.

The President, after calling the meeting to order, said: Gentlemen, the first paper this morning was to have been one by Mr. Kirkpatrick, but he is engaged with official duties and will not be able to be with us until later.

We will now take up the paper by Mr. Otto J. Klotz, on "The Northwest Angle of the Lake of the Woods." Mr. Klotz is not here, but has deputed Mr. Sankey to present the paper, which will now be read.

Mr. Sankey—Mr. Klotz was in Toronto a short time ago, on his way to Washington on government business, and informed me that if possible he would be present at this meeting and read the paper himself.

The plan illustrating the paper is so small that it will have to be handed round, that you may get a clear understanding of what the paper, which is headed "The Northwest Angle," refers to.

Paper by Mr. Otto J. Klotz (Ottawa), entitled "The Northwest Angle," was then read by Mr. Sankey.

Mr. H. DeQ. Sewell moved, seconded by Mr. H. W. Selby, that the paper as read be received and adopted and published in the Minutes of the Proceedings.

The President—The next paper is one on Mine Surveying and Underground Surveys and Plans, by Messrs. DeMorest and Sylvester, of Sudbury. These gentlemen are not present, but our Secretary, Mr. Sankey, informs me that he has their paper, and I will now ask him to read it to us.

Mr. Sankey reads the paper.

Mr. H. W. Selby—Mr. President, I have much pleasure in moving that the interesting paper just read be received and adopted, and printed in the Report of the Proceedings of the Association. It is a very elaborate and correct paper as to methods which a surveyor should adopt in such work. I have heard some of the members say that I am an old mining man. I can hardly claim to be that, as the country has not been developed in my neighborhood sufficiently for me to have had very much experience, still I do see a good deal of development going on, and naturally it interests me to hear such a paper read.

Mr. A. J. Van Nostrand—Mr. President, I have very much pleasure in seconding the motion. This kind of a paper is new to us; and there has been much talk about mining work among

our members. A number of our members have been practising, as Mr. Selby says, in districts where mining work has not progressed very far. Mr. Selby and a number of others will be called upon to look after underground work, and this paper gives a good foundation for making plans and dealing with the work. I think it is a very excellent paper for publication.

The President then put the motion, and, a vote having been taken, declared it carried.

The President—The Engineers' Bill was left over last night to be discussed this forenoon. I regret that Mr Chipman is not here this morning. Mr. Sankey, I think, has the Bill here. Perhaps it would be well for him to read it, clause by clause, so that we may ascertain the views of the various members on it as it is read.

The President—I think, gentlemen, that cleans off the sheet for this forenoon, and if you will be here promptly at two o'clock this afternoon, we will have a short but interesting session. The meeting is adjourned until two o'clock.

Afternoon Session.

The hour for opening having passed, the President took the chair and called the members to order.

The President—Mr. Sankey tells me that the Report of the Secretary-Treasurer is not quite ready yet, and Mr. Kirkpatrick, we believe, will not be able to be present this afternoon, owing to his official duties.

Mr. Jones has charge of the paper by Mr. Gaviller, on the subject of Drainage, and we will now call upon Mr. Jones.

Mr. C. A. Jones—Mr. President and Gentlemen, as I understand it, Mr. Gaviller has not in reality sent in a paper on the subject of "The Drainage Act, its Uses and Abuses," but has submitted a paper that no doubt a number of you have seen, in the shape of a series of eighteen questions, which I might read for the benefit of those who have not received a copy of the paper.

(The paper was then read in full by Mr. Jones.)

The President—Mr. Walker, the Chairman of the Entertainment Committee, is here, and he would like to have you all attend the Annual Dinner this evening. The members may interview Mr. Walker while the other business is being proceeded with.

Mr. Jones—I have here a paper written by Mr. A. S. Code, of Alvinston, on "Drainage," which I might read.

Mr. Jones then read a paper by Mr. A. S. Code, entitled, "The Field of Drainage Engineering."

Mr. Jones—I have received another short letter from a very intimate friend of mine, to whom I wrote asking if he would submit a paper on "Drainage," because he does a good deal in that branch—Mr. William Mazych Manigault, of Strathroy. (The letter was then read.)

Mr. Aylsworth—Mr. President, the two letters which Mr. Jones has read are both very interesting and pleasant, but I do not think it is necessary that they should be published in the Minutes, although they were good letters. I also think that we hardly need to publish Mr. Gaviller's paper. I would move that the communications from Mr. Gaviller, Mr. Code and Mr. Manigault be received and filed.

Mr. H. W. Selby—I will second the motion.

The President then having put the motion, declared it carried.

The President—You are Chairman of the Drainage Committee, Mr. Jones; have you anything from that Committee?

Mr. C. A. Jones—I have nothing further. I might say with regard to the report of the Drainage Committee, that through a misunderstanding, I did not know who the members of that Committee were, and I did not find out until yesterday, so that we have never had a conference, and I thought it would be just as well, and probably more profitable for us, to have discussions on the drainage matters and the Drainage Acts, as they were to be brought up. Owing to that the Drainage Committee is not able to present any report.

The President—The next item is, "Reminiscences of the Board of Examiners," by Mr. Unwin. I understand that paper is hardly ready yet, but Mr. Unwin will hand it in later on. Mr. Gibson may be here to-morrow, to read his paper on "Plans for Assessors," and Mr. Saunders, on "Irrigation Work."

Perhaps Mr. Sewell would now give his paper on "Transportation."

Mr. H. DeQ. Sewell then read his paper on "Transportation."

Mr. W. R. Aylsworth—I have listened with a great amount of interest to this paper, which gives many valuable items of

statistics which would require a long time to gather, were we to be required to consult all the reports and books which Mr. Sewell has had to consult when writing it.

It will be hard on the fish when the whites get into that country. When we used to go along the streams in the back country, where only the natives had travelled before the whites came, fish abounded.

I remember in 1866 going to the back waters of Muskoka, and our cook could get just whatever sort of fish he wanted for our breakfast. If the first fish he caught were not just what he wanted, he would throw them back into the water and catch what were wanted.

It is to be hoped that the whites will take a lesson from the natives, and when fish get scarce at one place, go to other fishing grounds.

I would move that this paper on "Transportation" be received and adopted, and published in the Minutes of the Proceedings of the Association, and that our thanks be tendered to the reader.

Mr. H. H. Gibson—I have much pleasure in seconding Mr. Aylsworth's motion.

The President—It seems to be the fate of the natives, fish, fowl and human, to be destroyed upon the advent of the white man.

Will all who are in favor of the motion manifest it in the usual manner?

The vote having been taken, the President declared it carried unanimously, and conveyed the thanks of the meeting to Mr. Sewell for his valuable paper just read.

Mr. H. DeQ. Sewell—I thank you, gentlemen, for your vote. My greatest trouble was to decide upon a name for the paper. The rest of it was made possible by going to a library and gathering the data.

The President—Mr. Stewart's, Mr. Gibson's and Mr. Saunders' papers are not ready; the papers which are still to be heard cannot be given until to-morrow.

The meeting to-morrow will be held in the Repository, at the Crown Lands Department.

I again express the hope that we may see you all present this evening, at eight o'clock. The meeting is now adjourned.

MORNING SESSION.

Thursday, March 20, 1902, 10 o'clock a.m.

The President in the chair, called the Convention to order, and asked Mr. L. B. Stewart to present the report of the Topographical Survey committee, of which he was Chairman:

Mr. Stewart—The Topographical Survey Committee has nothing to report. I did my best to call a meeting of the Committee of the members resident in the city, but we were all so busy we were not able to get a meeting. However, I have seen the various members who live in the city, and written to those who live outside, and they all make the same reply, that there is nothing to report.

I think it is a favorable sign that the Dominion Government at Ottawa is constructing an astronomical observatory and equipping it, among other things, with a 12-inch refractor. If they have been induced to do this much for science, I think ,Mr. President, pressure will induce them to inaugurate a trigonometric survey. I think we are drifting in that direction, and there is no doubt that a trigonometric survey, being of a useful character, as well as of interest to science, they may be induced in time to undertake such work.

The Topographical Survey Committee should not be discontinued, because almost any year there might be something to report that would be of great interest to Surveyors.

Mr. Aylsworth—For the information of Mr. Stewart, who was not at the dinner last evening, I may say that Mr. Klotz gave us some very interesting information on that question; he told us that the metric system was very likely to be introduced in the near future, as it would be introduced in the United States; and whether Canada or England will take the lead in it, of course he did not know, but he felt somewhat inclined to think the Dominion Governmeit would adopt it and make it compulsory, before England did.

The President called on Mr. P. S. Gibson for an address on "Plans for Assessors."

Mr. Gibson gave his paper in the form of an address.

Mr. Gibson—So far as the Township of York is concerned, I will speak particularly.

At the time the boom was on in our township and in the city of Toronto, and for years previous to that, there was an

extensive sub-dividing of the land, and the Township Council found it was practically impossible for the assessors to make a proper assessment of these properties. Very often they got hold of lithographed plans, and the plans were amended so frequently, that ordinarily they knew but very little about the lay of the land or the sub-divisions, and they very often made mistakes. They sometimes assessed the same property twice over, and other properties were not assessed at all. It was a common practice on their part just to go to the companies who owned certain blocks of land to find out how much land they had, and they credited them with a certain acreage. These companies were pretty wide-awake, and if they didn't want to pay taxes it was more convenient for the assessor to assess their property in blocks of say ten, fifteen or twenty acres instead of by lot numbers. When the time for the payment of taxes came, the returns had been made en bloc, and the companies holding these lands paid no taxes. Then in the May return by the Township Clerk to the County Treasurer, he returned as unpaid the taxes on a block of land, part of township lot so and so; the companies would go to the County Registrar and ask for a certificate as to whether any taxes were due on lots numbers so and so, giving the numbers right through according to such and such a registered plan; they would say they expected the taxes were paid, but there might be some oversight, and, therefore, they were anxious to pay their taxes if due. The County Registrar would run over his return and give a certificate, that there were no taxes due on the lots as numbered on such a plan, which they would just file away, and give the County Registrar a very good fee. In three or four years the result would be the county would put these lands up for sale and as soon as they sold them they would have to redeem them.

In consulting with myself and others we advised them to prepare what we called Assessment Plans. They are got up in this way (refers to prepared plan). They are simply plans that the assessors have, and we blue-print them. This is a large plan showing a thousand-acre lot, on a scale of 200 feet to the inch. Although they are not registered, the registrars in the county and the Master of Titles like to get copies of them. We show upon these plans all the plans that are registered; we compile them up to a certain date; the date is fixed at which we refuse to take any further plans. The practice was to advertise in the county or local newspapers that after such a date any

plans that came into the Registry Office would not be put upon the assessment plans. Now and then a plan is amended, and these amendments have to be shown on the plan. We show the number of lots, the dimensions, the courses to a certain extent, sufficient for assessment purposes so that the assessor can refer to them in that way, and he is expected to assess these lots separately, according to their numbers, so that when lots are to be sold, they can be advertised properly. There is no notice given. We have two offices to look into for plans, the County Office, and the Master of Titles' Office. If you go to the County Office and you take a plan there, it is proof positive on the very face of it that it is what it appears; you go to the Master of Titles' Office and you find a plan there with the Master's certificate on the corner of that plan, certifying that it is Plan M., 70 or 80, while as a matter of fact, that plan only covers a portion, and there may be an odd lot in there that does not belong to that plan at all. You couldn't get any knowledge of that from looking at the plan; you have to search up the title and the application from the individual or corporation owning the land. That leads to a lot of trouble. A Surveyor should not be called upon to search a title to find out what a plan means; it is so utterly contrary to all ideas we have of plans. We intend that the certificate we usually put on a plan shall define the lots that come under that plan. In addition to these two offices, we also have to put upon our assessment plans all the title deeds of the properties owned by people under deeds, titles or conveyances. If a man has the sub-division or number of a registered plan in his deed and he sub-divides it, we don't bother with it, but where it is a portion of a township lot conveyed by deed, we have to search that out. We call upon the party on the ground and look at his title deeds and he gives the history of it; sometimes the deed is not registered at all. So that each case necessitates a personal visit. We put on that plan sufficient information from the deed so that the assessor can assess that property. We give him a proper description, length, width and courses, and distances, and we give the acreage, as a rule, sufficiently close for assessment purposes.

Take a village like Todmorden. I go and search up the titles and I find that the whole village is wrong, practically; six or seven chains extra in the length of a concession. When I was putting the properties on the plan of that little village, I had to survey every lot; I surveyed all the streets right through.

and I had a local person with me who knew the name of every person there. I went through the village for about two days, and measured the whole of it.

Then in another class of property for assesment purposes the registered plans may be wrong. I had a case where I made measurements for the local improvement, and whereas one man should only have had fifty feet frontage, he had two or three feet extra, and his neighbor was so much short. When they were notified, they appealed to the Court of Revision, and it was referred to me. I went on the ground and said, "I will make the return properly, and put the assessment on proper persons, and you will put the fence back." They said, "Don't bother about that at all; just let the thing go. Good morning, Mr. Gibson, we won't trouble you any further." The result was, they occupied the land as heretofore and paid the rate. That is what I mean by holding by possession. If you have to prepare a plan for registration, according to the paper title, you have to show those properties as they are held by paper title.

There is another class of land known as remnants. For instance, a man has a block of land for a garden, and there is a piece of land in it that he does not really own, thus there is a remnant. We either have to go and survey that on the ground, or we put on the courses and distances of the adjoining deeds, which govern. There may be a strip a certain distance wide; I usually put on the plan that the remnants are described by the metes and bounds of the adjoining properties, and then enter it up in such a way as to show that.

The most important point is to make a proper agreement with the corporation. For instance, the corporation wants an assessment plan. You advise them that all the points I have mentioned here should go into the agreement.

There is a by-law usually passed, because there is money to be expended, or the seal of the corporation attached to the resolution, so that they may clearly and distinctly understand what you are going to do.

That plan is not for registration. In the first place the assessor is enabled to assess those lots practically in his own house, before he leaves his office, and he has them up-to-date. When he leaves his office he goes to the place and takes a tape-line and locates the dwellings on the lots.

For instance, one of the assessors made a mistake; he thought

a certain lot had a building on it, although it was returned year after year as being a vacant lot, and the owner refused to pay the taxes. The result was it was going to be put up for sale. I examined it and found that there was no house on the lot at all. I asked him about it, and he said he just guessed!

The Engineer guarantees that these assessment plans represent the lands that can be assessed up to a certain date, and that they are properly shown on the plan. The assessor or the owner can at once refer to the plans and locate the lot in question on the plans. In that way double assessments are saved.

Then the Township Clerk can strike off three or four copies of these: the Township Treasurer, the Registrar, and the Township Council each have a copy. The result is, if any question arises in the Council-room the plan is simply taken out and referred to. Then the Township Clerk, having a record of these, supposing a plan is amended, he draws his pencil across the portion of it referred to in the plan and enters up the portion of the plan that is new.

Just a few words as to the way we expend the money that is raised. In the Township of York there are no statute labor payments at all. That is, I should say, people do not work out their own statute labor; it is all commuted; the result is, we get about $11,000 a year in the Township of York in lieu of statute labor.

Mr. Aylsworth—Do you remember how much per day?

Mr. Gibson—They are assessed at one dollar per day for assessment purposes, and when they work they are paid $1.25. The Engineers are practically old pathmasters. One day there was a question raised in the Council as to how I spent that money. I said, "Gentlemen, we are the pathmasters, we know where to spend that money and we do it in the best way; we don't come to ask you about where we are going to spend it." In fact, we spend about $20,000 a year on our roads and bridges.

Mr. Aylsworth—Not in the township alone?

Mr. Gibson—In the Township of York alone. We generally submit to the Council every year what we are doing. Besides the $11,000, we spend about $8,000 or $9,000 more, that makes up about $20,000. It just depends on the year, and what the circumstances are. That is what we call a payment out of the consolidated revenue of the township. In order to allocate this

work we have divided our township into fourteen divisions, and we prepare blue prints. You can see red marks all over this plan I have here. These divide the township up into fourteen sections. Our Treasurer keeps four distinct accounts for what we call four divisions of the township. Now I have a statement from the Township Clerk. We as Engineers of the township furnish him with a plan showing the lots in each of these sections and he tells us how much money will be due on statute labor for each of these divisions, and they are entered on this plan. I send a portion of this plan to each of the fourteen foremen in the township, and they know how much money they have to expend. We instruct them that each farmer having 100 acres of land must put in six days in the year; if they do it by labor they get $1.25 a day; if they do it by man and team we pay them as a rule about thirty cents an hour; that is, laborers twelve and a-half cents, man and team, thirty cents an hour, or $1.25 and $3 a day. These rates are varied. We know about the time the work should commence or be done. I take the foreman and drive him all over the section; he examines the work and he finds out what is being done. Each of these foremen has a pay sheet and each of these pay sheets sets out the name, post office address, and has letters for the different items, for instance, L for "laborer," T for "team," and so on; then it goes on and describes how many cubic yards of gravel for instance, and where it is laid on; then each column is added up. The same thing is done all over the township. There may be some where it is a line between two divisions; he makes a return showing the expenditure, which we divide up. These returns come in to us the Monday before the Council meets, and all those pay sheets are consolidated into one; these are carried into the four Engineers' pay sheets and, these are carried out, with a memo opposite each man's name, showing what work he has done, the hours he was employed, and they are totalled up for the Treasurer to draw a cheque. The result is, when these pay sheets come into the Council, the foremen's pay sheets are put before them; and the councilmen look over the pay sheets in the divisions nearest to each of them, and then the Council passes the foremen's pay sheets; then the Engineer's pay sheet is taken up, and then they go on to the Treasurer and cheques are issued. There is a column giving the number of the cheque in the Engineer's pay sheet, and the auditors afterwards refer to this for the whole business. Once in a while

they pass accounts in the Council that do not go in the pay sheets.

We generally get a good-natured, sensible fellow in each section who understands road work, and he runs it that way; we have got the useless men weeded out, and all are pleased with this commuted labor system; it is quite satisfactory.

Mr. Dixon—The whole of your time must be employed in your township?

Mr. Gibson—Three of us. We get $700 a year as Engineers. Our foremen are paid about at the rate of $1.50, $1.75, or $2 per day.

Mr. Aylsworth—You say there are three of you; $2,100?

Mr. Gibson—No; $700 is paid to the three Engineers. The people found fault that they could not understand the report of the auditors, as to where the money was expended, so we keep a set of books showing the amount of money in each of the fourteen divisions. We report separately for each one of these sections, showing first, the amount of commuted labor to their credit, secondly, the amount of expenditure, and then totalling them and showing whether they over-ran, or what sum remained to their credit. Then we look through all our pay sheets and find out how much money was expended for material of different kinds, stone, brick, lumber, gravel, machinery, and each foreman's pay, showing that in some cases probably half the expenditure was in material and for buying machinery. We have machinery of the latest kinds. This is to be published in the Township Minutes. Besides that we make out each year a statement of the amount of plant each of these foremen has in his possession, and that is printed.

Mr. Aylsworth—I think we are indebted to Mr. Gibson for the information he has given. He having been to a certain extent brought up in the Township of York with his sons there, his system, I suppose, works very well with those who know all the ins and outs of it. It strikes me, however, it is too complicated for ordinary places. Now, in the County of Hastings we have something over 400 miles of county roads, and on these roads we have 176 county bridges. These roads and bridges are maintained by the county, and the county appoints a superintendent of roads and bridges, and gives him a certain amount of money annually, to expend on each particular section of these

roads. He has gangs of men with foremen over them, and every month these foremen make a return to him, and he brings it in and I enter it up in the county books, showing what was paid for material and the number of days that each man worked. Then each man signs that book; he draws the money and pays it out; it is somewhat on the same lines as they have here in the Township of York, but it strikes me that it is much more simple. It may not give quite as much detailed information as Mr. Gibson's system does, but it is entirely satisfactory to the people of the county.

Mr. Gibson—How much do you spend each year?

Mr. Aylsworth—About $20,000 in the whole county. We have twenty-three municipalities in the county, and a number of them have commuted statute labor. It has worked now three years; they have a road superintendent, and he has his men under him the same as you have. They only tax the assessed party fifty cents for a day's labor, and he finds he accomplishes more work for fifty cents per day for labor than the men did when they did their statute labor. There were many objections the first year by parties who were opposed to the superintendent and to the Council that had abolished the statute labor. But he went into each beat and appointed the old pathmaster, if he was a competent man and willing, and instructed, him and they are very fond of the system now, and it is working admirably.

Mr. Gibson—In reference to the county road system, the County of Hastings is not settled up like the Township of York. I don't say we have sewers and electric lights equal to the City of Toronto, but we have better roads than in the City of Toronto. They tried to introduce this system of county, roads, but it did not succeed. They couldn't settle on any scheme at all, and they quietly abandoned it. We told them we would rather keep up our own roads. We find now that we had not to pay on one-tenth of a mile, until this last year, over and above what we had before the York roads were given up. Many men save from $25 up to $50 and $100 a year on tolls; and then each man contributes a certain portion equal to his statute labor. A system was proposed, but they couldn't agree, and that is probably why the old system was abandoned.

Mr. Aylsworth—The county road system was adopted in the County of Hastings before my time; the county then issued $200,000 debentures and bought out the county roads and re-

moved the toll gates and paid for them, and I am very glad to say we have no debenture indebtedness in the county. During the last forty-one years, we have expended over a million dollars, and we have no county indebtedness. The City of Belleville is not connected with the County of Hastings for municipal purposes; but in the county we have both incorporated and unincorporated villages, with electric lights and all that sort of thing.

Mr. Dickson—How much will you spend per annum on your roads altogether?

Mr. Gibson—$20,000 in one township. Sometimes more; we build steel bridges and everything like that. In the County of York we had quite a number of these toll roads. I was appointed Engineer and I shut them all up. I served a notice on the man at the toll gate to stop taking toll, and if he didn't we would send him to jail. That is the way we closed them up.

Mr. Aylsworth—Our County Treasurer in Hastings has been forty-nine years in the service of the county, and a few years ago he asked the County Council to get me to make assessment plans of the municipalities, because there is no matter that he had to deal with as County Treasurer that gives him so much trouble as the returns of unpaid taxes in the various municipalities. He has to send out the returns time after time before he can get them correct. He must have such a description of the lands returned with taxes against them that a Land Surveyor can take that description and locate the land. Unless they have something to guide them there is not one assessor in 100 that will make such an assessment that you can sell the lands assessed on it. An endless difficulty arises. However it may be remedied in the future when we get the new Assessment Act. The County Council thought the preparation of assessment plans would be too great an expense. I think they made a mistake, although I was not very desirous to have the work, because I generally had about as much work as I wanted to do for the various counties. But really these assessment plans ought to be made in each county; that is, each municipality should have an assesment plan to aid the assessors in properly describing the land.

Mr. Gibson—They paid us $1,500 for thirty-one sheets.

Mr. Selby—Mr. President, I have very great pleasure in

moving that the report of this address be printed in the Annual Report of the Association. I have listened with a great deal of pleasure to it. For nine years I was assessor for a municipality, and I was instructed to prepare plans on the same lines as Mr. Gibson has described—perhaps not so elaborately. Of course it was not necessary in a country district, but it was found as valuable to the assessors who followed me as it was to myself.

Mr. Wilkie—I have pleasure in seconding the motion.

The President put the motion, which, on a vote having been taken, was declared carried.

On motion of Mr. Sewell, duly seconded, a vote of thanks was passed to Mr. Gibson for his very valuable and interesting address.

The President stated that the next thing on the program was a paper on "Irrigation Work," by Mr. B. J. Saunders, but that as yet this paper had not come to hand.

Mr. Van Nostrand moved, seconded by Mr. Ross, that the paper by Mr. Unwin, entitled, "Reminiscences of the Board of Examiners," be taken as read and printed in the Proceedings. Carried.

Mr. Aylsworth—I think it might be in the interests of this Association if the Annual Meetings were hereafter limited to two days. It is quite a tax on some of us to remain so long away from home. I think all the work that we now do in three days might be easily done in two. I don't know just what the by-laws and regulations are with reference to this.

Mr. Van Nostrand—The Statute fixes the Annual Meeting of the Associaton as a corporate body for the fourth Tuesday in February, and it has just been a matter of convenience and necessity to make it a three-days' meeting. The actual meeting is supposed to have taken place on the fourth Tuesday in February. This year it was found necessary to adjourn that meeting, so that I suppose the Tuesday of this week takes the place of that formal Annual Meeting. It is only a matter of deciding whether the program that is forthcoming at the Annual Meeting will warrant a three days' meeting. On other occasions when the program has been longer, we have found there was a good deal of work for the third day, and it carried us on into the afternoon. The date of the annual dinner has been fixed for

Wednesday because Wednesday afternoon is usually the best attended session we have, and we like to have as many at the dinner as we can. If the proceedings were wound up on the afternoon of the second day, our dinners would not perhaps be quite so successful. Many would feel the dinner was not a necessary thing and would leave. I think perhaps the matter might be left with the Council. It is a pity to waste a third day if two days would suffice.

Mr. Gibson, Sr.—I would support Mr. Aylsworth, on the understanding that it is a recommendation or suggestion to the Council. Of course they must know before-hand in preparing the program.

Mr. Gibson, Jr.—Would there not be an advantage in having a three days' meeting, so that those not living near or in Toronto could attend at least one day? It is not necessary for them to stay for three days if they find it difficult to do so.

Mr. Van Nostrand—The disadvantage is, that the officers of the Association who come from a distance feel bound to stay.

Mr. Gibson, Jr.—That only occurs once in a while; the same officers are not officers of the Association for many years.

Mr. Ross—The annual dinner could be held on the first day if we had a two days' meeting; and we could meet in session at nine or a quarter to nine o'clock, as well as ten o'clock. We could meet at nine promptly and get through a good deal of work. Then, also, the afternoon meetings are generally not opened until three o'clock, or perhaps later. By meeting promptly at the hour named so much time need not be wasted.

Mr. Van Nostrand—One disadvantage would be that it would cut us out of our evening session, which is a very good one; some very interesting papers are set for the evening session, and we have visitors who are interested in those who probably could not attend during the day. I think it would be unwise to make such an arrangement as would do away with at least one good evening session, in addition to the session at McConkey's.

The President—There is one thing I very much object to, and that is the want of punctuality in the attendance of the members at the hour appointed. We have not had a session at which there was a quorum until half an hour or an hour after the session was opened. The Committee who get up the pro-

gram next year, acting on the suggestion thrown out in this meeting, will no doubt try if they can vary the program so as to have a two days' meeting.

Mr. Gibson, Jr.—And have some of the best papers for the dinner!

Mr. Ross—The last session should be closed promptly at say not later than about four o'clock in the afternoon.

Mr. Van Nostrand—There is a matter which I believe is the business of the Association. We have no Standing Committee on Legislation, and this year it was found very important that we should have had one. Perhaps this afternoon would be the best time for us to take that matter up, under the heading of unfinished or new business, and appoint a Special Committee on Legislation, so that when matters affecting the Association of Land Surveyors at large come before any legislative body, there will be a Committee empowered to act upon it in the name of the Association.

This year it was necessary to take certain steps to see that the interests of the Land Surveyors were protected, and there was no one to do it, except on his own responsibility. Those who did anything had to do it unofficially. If you have a Legislative Committee it would have to be a special one, as we have nothing in the by-laws providing for it, I believe.

Mr. Ross—I move that Mr. Van Nostrand be Chairman of a Special Committee on Legislation, together with Mr. Sankey.

Mr. Van Nostrand—I beg to decline. There are other men much better qualified to take hold of these matters, and I think if we allow the matter to stand until this afternoon we will perhaps have a better attendance, and we can give the matter due consideration.

On motion of Mr. Aylsworth, seconded by Mr. Ross, the meeting adjourned to meet at 2 o'clock p.m. sharp.

Afternoon Session.

Thursday, 20th March, 1902, at the Repository, Parliament Buildings, Toronto.

The meeting was called to order at two o'clock p.m., by the President.

The President—The first thing we have on the program this afternoon, gentlemen, is the Report of the Secretary-Treasurer.

Mr. Villiers Sankey—Mr. President and Gentlemen, I have not been able to complete the report so as to have it audited in time to present it at this meeting of the Association, but the report will be audited and presented to the Council at its meeting in the third week of April, after the elections.

I may say that I regret exceedingly to find that I have not been able to attend to the duties of Secretary in the way that the Association had a right to expect, for although in some ways, I am my own master, in other ways I am not, not to such an extent as a man in private practice would be.

Although the work is not very difficult, it still requires a certain amount of time; but the work and the time have to be done and given at the right time.

With regard to the Annual Report, I was very late this year in getting it distributed. It was not the fault of the Publication Committee in any way. Their work was done promptly. The delay has been entirely my own. I have mailed nearly one half of the copies of the Report, and the other half is ready to mail.

With regard to our Exchanges, I have only received two as yet, and they have come in within the last three weeks. The other Associations, for some reason which I cannot explain, are in the same condition as ourselves—their reports are about ready to be distributed. Although I have only received two of them, the other exchanges are coming along, and we are ready to exchange with them. The exchanges will be practically the same as they have been in the past.

Another point upon which I would like to have some instructions, is as to the steel tapes which it was decided to have as a standard measure. I have not ordered a large number of

them, because I did not know how many Surveyors who already had the ordinary standard were prepared to pay four dollars plus the duty for the tape.

After what Mr. Klotz said last night I thought that Surveyors who have the standard or use steel tapes that they know to be correct, had better wait until they see whether the metric system is going to be adopted.

There are a few Surveyors who have got their licenses recently who have not been given the standard. That would be easily remedied, for the steel tape in feet and inches would be all right for years to come. I think the Surveyors who have got the regular standard had better wait.

With regard to the Council of Management, I will read from the Minutes of the last meeting. There has been nothing very special before the Council this last year. There are no new by-laws. The last meeting was in February, and there is a point which is of importance to the students of the School of Science. Possibly after the statement is made which I have now to make, I will be authorized to send a printed notice to all concerned. It was about the examination of the students from the School of Science, from McGill and the Royal Military College. Their final examinations take place, as I understand, in April, May and June. A student files his articles, say, in June or July, and he has not the year through when our examination comes on in February. So they may have to wait for two years before they can pass our final examination.

The matter came up at the last meeting through a letter written by Mr. Baker, O.L.S., of Ottawa, whose son hopes to graduate this month in McGill, and he asked what the Board would do as to examining him or permitting him to sign articles before he graduated.

The result of the discussion was that in the opinion of the Council, the Board of Examiners of the Ontario Land Surveyors is justified in examining articled pupils prior to the expiry of their articles; such pupils, if successful in passing their examination, to be sworn in at an adjourned meeting, after proving that the required service and discharge has been granted, and

that the length of such unexpired term be recommended to be limited to four months.

That appeared satisfactory to the Board. In other words, a man who signs his articles in May or June of a year can come up in February and be examined, and, if successful in passing the examination, after serving his unexpired time, if it is not over four months, he may come back to Toronto and be sworn in by the Chairman of the Board on resolution of the Council.

I am sure a good many of Mr. Stewart's students are interested in this. We are not really breaking any very strict code of practice or Act of Parliament. They have to graduate first; they cannot sign articles until they have graduated, and it is only a matter of completing a term of service of three or four months. That seemed to be far better than allowing a man to be articled before he had graduated.

If he takes a week or so out of his service to pass his examination, he still has his three or four months with his master, and it seemed as though that would satisfy everybody.

The only other point was, as to what position this Association would take with regard to Manitoba. Two Ontario Land Surveyors wrote to ask whether the Manitoba Land Surveyors would recognize the examination of the Ontario Association, and how far they would recognize it. Their desire was to become Manitoba Land Surveyors, and they were told by the Board there that if we would give them reciprocity, they would do the same with us. The Council replied that a full-fledged Manitoba Land Surveyor would not be asked to serve any time, but would be asked to pass all the subjects on the Ontario list that are not on the Manitoba list.

(Mr. Sankey then read the letter referred to.)

I think these are the only points that we have to report. Mr. Butler has again been appointed by the Lieutenant-Governor as one of the Board of Examiners.

The President—There is a report here from Mr. Henry Smith, Superintendent of Colonization Roads, which while not on the list of subjects on the program, is well worth reading, and it is for the meeting to say what had better be done with it.

Mr. Sankey then read the paper by Mr. Henry Smith, on "Municipal Roads."

Mr. George Ross—Mr. President, I consider that paper contains many items of information of value to the members of this association, and I move that the paper be received and adopted, and printed in the Annual Report.

Mr. H. H. Gibson—I take very great pleasure in seconding that motion. I think the paper will be appreciated by us all as a good historical paper. It gives an outline of the different classes of surveys and roads which have been constructed throughout our Province. Such a paper as this would be often very useful when looking up information relating to roads running through the Province of Ontario, in our own indivadual work. We often have to turn up Field Notes for these roads, and, if we know on what method they are run or laid out, it will help us to look for the information we want.

The President having put the motion, declared it carried.

I have here a resolution of regret at the loss of some of our members: Moved by Mr. Van Nostrand, seconded by Mr. H. H. Gibson: That the Association has heard with deep regret of the loss by death of the following members of the profession since the last meeting of the Association: Tom Kains, J. N. Bolton and Wagner Fitzgerald, and that a copy of this resolution be forwarded to each of the respective families of the deceased members.

The resolution having been put, was declared carried unanimously.

The President—There is another matter I would like this Association to pronounce upon. A gentleman having retired from active life writes the Secretary that he is not going to practise, and he does not pay his fees; but he goes on practising, doing work, going into court, etc., as an O.L.S. We feel annoyed when outsiders come in to do such work; but we should feel worse when a one-time member of our Association acts in this way. This is not a personal matter with me, as I have never met the individual. I think we might instruct someone to attend to such cases.

Mr. George Ross—The Association should take notice of this. It is very discreditable to anyone to do such a thing as we have just heard of. Perhaps the party may have intended to retire, and

may have been asked and almost forced into doing some work as a favor. Of course, if he did it maliciously, with intent to defraud the Association of his fees, or to deal in bad faith with the Association, he ought to be proceeded against rigorously.

Mr. Villiers Sankey—The larger point is not whether or not he has done it maliciously against the Association, but that we have to protect the public.

In the case in point, the man wrote more than one letter to the Secretary, and most distinctly stated that he wanted his name taken off the list on the first of April then next coming. His name was accordingly taken off the list, and has never been put on since. He has never since tendered his fees, and has never asked to be re-registered.

This is not a case of a person practising illegally. There you take him before the court of competent jurisdiction, the police magistrate or the county court.

The Association in one or two cases has been represented by a specially appointed solicitor. There was an instance not long ago, near Ottawa, where we practically had five cases against a man, and we took him into court on one, and he was fined $40 and costs, and on the absolute assurance that he would not practise illegally again, our solicitor wrote back, saying he thought it would not be wise to prosecute the man in the other cases, although we had good evidence against him.

This is a case which may come under a different heading. I understand the Board of Examiners or the Council of Management have to take it up. I do not now recall which of the two bodies is the senior. On the statement being made as to the improper practising, he is summoned before the Board, and he has to attend. That is provided for in one of the recent amendments which we have obtained to the Act, that upon receiving a subpoena and his conduct money and expenses from the Chairman of the Board, he is forced to attend, and witnesses attend. In other words the Board has in that regard about the same powers as an Assize Court. I do not know whether the man could be fined or whether his license could be taken away, but certainly from what the President has told me about this case it seems to me it is a proper case for an investigation.

If the man has made plans and signed them as an Ontario Land Surveyor, and has put them in the Registry Office, it would appear to me to be perfectly clear that the plans are improperly received there—the Registrar probably did not know that the Surveyor was unqualified.

The Act distinctly says that anyone to practise surveying in Ontario must be officially qualified to do so and must remain registered and continue to be registered. Then, when a man withdraws, he withdraws his name from the registry; if he wishes to resume practice he must request to be re-registered.

Under those circumstances, I think it would be wise for the Association to have an investigation made in the locality, in the Registry Office and other places where this work has been done; and then if the Council of Management thinks right, let the case be handed over to a solicitor to deal with it.

Mr H. H. Gibson—When I first heard of this case, I asked whether the man referred to had signed himself as an Ontario Land Surveyor or as a Provincial Land Surveyor, and the information given me was that he had signed as an Ontario Land Surveyor. It might appear that a Provincial Land Surveyor could act as such, but he could not act as an Ontario Land Surveyor under the Act. The Act includes Provincial Land Surveyors but does not do away with the Provincial Land Surveyor. I would like to hear that point discussed.

Mr. Van Nostrand—I may not be correct in my recollection of the statute, but my belief is that the statute is clear, inculpating any man who exercises the duty of a Land Surveyor without having been duly authorized, even if he only makes a survey of a natural boundary.

Mr H. H. Gibson—Of course the certificate he obtained as a Provincial Land Surveyor gives him the privilege of making surveys.

Mr. Van Nostrand—The new Act makes provision for that.

Mr. Villiers Sankey—Section 3 of Chap. 180 of the Revised Statutes of Ontario, 1897, reads as follows: "No person shall act as a surveyor of lands within this Province unless he has been duly authorized to practise as a Land Surveyor, according to the provisions of this Act, or had been so authorized before the passing thereof, according to the laws then in force, and shall have become registered and shall continue to be registered under the provisions of this Act, under a penalty of $40."

That section shows who may practise and in the same way section 42 shows who may not practise. Sub-section 2 of section 42 says: "A registered Surveyor desiring to give up practice may have his name removed from the registered list of practitioners at any time, upon giving written notice to the Secretary-Treasurer of such desire, and paying up all fees due from him to the Association, and thereafter he shall not be liable to the Association for annual or other fees, and may, upon like notice of his intention, resume practice, and by paying the annual fees for the year in which such notice is given, have his name re-registered.

Section 3 requires that he shall become registered; then under section 42, sub-section 2, when he withdraws he shall have his name removed, and when he comes back again, he has to have his name re-registered.

Section 3 says he shall do so under a penalty of $40; that may be taken to mean that you may take him into an ordinary court—county court or a magistrate's court—as you would an outsider; but, on the other hand, it may be that he would have to be brought up before the Board and disciplined.

The President—I think he places himself in the same category as a man who has never been registered.

Mr. George Ross—I think this matter had better be referred to the solicitor, and that the Council of Management be guided by his advice.

Mr. Villiers Sankey—The first thing to do is to make a proper investigation into the facts of the case, so as to get some sort of a history or brief for the solicitor to work on. We would have to submit a case to him.

The President—He has gone into court and taken his oath that he was a duly licensed Surveyor, and he has registered plans since he withdrew from the Association. I am credibly informed that he does all the work he can get to do, just as the rest of us do.

Mr. Villiers Sankey—I suppose there would be no difficulty in getting someone in the neighborhood to speak as to that.

The motion was then put, referring this matter to the Council of Management to be dealt with, and carried.

Mr. H. W. Selby—With regard to the standards of measurement, the Dominion Land Surveyors are obliged to have the

standard furnished by the Dominion Land Surveyors' Association. We have those. Is it necessary for Ontario Land Surveyors to buy others?

Mr. Sankey—Any Ontario Land Surveyor who has the original standard that he got when he passed his examination, is not bound to buy anything more if he does not want to. But a great many members of the Association have expressed their desire to get a steel tape that would be accurate. In the last couple of years we have not given the wooden stick to the new members who have passed.

Mr. H. Selby—The Dominion Land Surveyors have to get the tape, which costs eight dollars.

Mr. Sankey—If you have that steel tape and do not feel like buying another, I do not think we could compel you to buy one. The last four or five men who have passed our examinations have not received the standard which they are supposed to have; it was held off, as there was anxiety to get a proper steel tape of some kind, but I thought it wiser to hold back for a little, for if the metric system comes in, the tape divided as at present would be of no service.

Mr. P. S. Gibson—I want one of those tapes.

If Mr. Klotz gets the metric system adopted, for about three or four years they would be optional, and then after that they would be compulsory. Mr. Klotz said that the United States would likely adopt the metric system.

Mr. Gibson—Some of our members got the wooden standard, but do not now know where it is. If they have the Dominion standard, would it be accepted as a standard for Ontario? The Dominion will not issue the standard issued by the Ontario Association.

Mr Sankey—I think every Ontario Land Surveyor should be in possession of a standard up to the official standard, and if a Surveyor in Ontario who was accused of not having a standard, were able to say, "I have the Dominion Land Surveyors' standard," I do not think any court of law would condemn him.

Mr. George Ross—Many of those who have the Dominion standard no doubt also have the Ontario standard.

Mr. P. S. Gibson—I think there is a difference of something like three hundred-thousandths of an inch.

Mr. Kirkpatrick—The difference is .00057559 of an inch, as shown at page 16 of the Annual Report for 1901. The present standard yard in the possession of the Secretary was compared with the Tabular Standard Scale of the Royal Astronomical Society, and the result of the comparison makes it .000008 of an inch longer than the middle three feet, or Standard Yard upon that Scale.

Mr. H. T. Gibson—I suppose if they had said it was absolutely correct, we would not have believed them.

Mr. P. S. Gibson—Under the instructions of the Crown Lands we have to verify our measurements.

Mr. Sankey—If the metric system were adopted in the next five or six years there would be no use in Surveyors buying new tapes now, unless as a standard.

I think we ought to order an ordinary tape with feet and inches, etc., and give it to the new men, and then wait until we find out whether the new standard is to be metric or to remain in feet and inches.

We have either to give the new men the old sticks, or to provide something else.

Mr. A. J. Van Nostrand—Give them the old sticks.

Mr. Gibson—How would it do to get a standard tape with the metric measurements on the one side and feet and inches on the other?

Mr. Sankey—The tape that we adopted was thirty-three feet on one side and fifty links on the other side, and one foot was divided into inches. Of course we might get the meters put on where we were to have the links marked. The Lufkin Rule Company, who are the contractors for us, will put on any sub-division we like, and I do not suppose it would make any difference in the cost, if instead of putting the links on, they were to put the metric measurement on. Perhaps they would divide part of the back of the tape into centimeters, or whatever was necessary for us.

Mr. L. B. Stewart—That would be all right, and then a portion of it might be divided into decimeters, etc.

Mr. Villiers Sankey—If there is nothing more before the meeting, I wish to tender my resignation as Secretary. I have

thought the matter over, and have come to the conclusion that I am not doing the Association the justice that it ought to receive, and I hope you will be willing to receive my resignation and to overlook my shortcomings in not getting out the Report, and things of that kind that have occurred during my tenure of the office.

I have to thank the Association for a great many honors and favors, and for the good fellowship experienced, and although I am tendering my resignation, I can assure the members that I will not lose the interest that I have had in the past, and I hope that our Association will go on and prosper as it has done, and that in the future it will be just as successful and as useful to the Ontario Land Surveyors and to the public as it has been in the years gone by.

Mr. P. S. Gibson—You haven't got mad or anything like that, have you?

Mr. Sankey—Oh, no.

Mr. H. H. Gibson—I am sorry that Mr. Sankey has come to this conclusion. I think I had the honor of making his nomination for this office, and I have not regretted it. Of course, Mr. Sankey knows his own business, and he has a great many duties, as a professional man, and I believe he is also interested in a great many other matters, some of national interest, and they all take up a great deal of his time. I fear it will be necessary for the Association to accept his resignation, although, if he can alter his determination in this regard we would be very pleased to continue to avail ourselves of his services. I will make a motion to that effect, if there is no more discussion upon it.

The President—I should be very much pleased to see Mr. Sankey continue in his position. He is a very nice gentleman to do business with, he is so friendly and all that, but of course he knows his own business best.

Mr. Van Nostrand—It is with regret that I hear that Major Sankey is going to withdraw from the office of Secretary of the Association. He says the report did not come out as promptly as he would have liked. While that is true, there are a great many other matters which he has attended to in a manner which far surpassed anything that could have been done by his predecessor. The Association is not aware of many of those things, but I happen to know a good deal of the work that he has done

during the past two years, and the services he has rendered to the Association are more valuable than those which the Association has had prior to that time.

I regret that he has decided that it is impossible for him to carry on the work of the office for another year, but since he has come to that decision, I beg leave to second the motion that his resignation be accepted.

The President—Does any person else wish to make any remarks before I put the motion to the meeting, or will Major Sankey withdraw his resignation?

Mr. Sankey—No, sir; I cannot. I am not my own master as much as I would like to be, in order to do justice to the Association. There is a Municipal Council of Aldermen, and there are other officials in the Hall, and while I may have a certain amount of leisure, I do not intend to furnish room for any of them to found a complaint or a grievance. I cannot go to them and tell them that I want to go to the Parliament Buildings. If it were a private client, one could tell him, "I cannot attend to your work until next week."

I could go on for another year or two years, as I have done in the past, but the Association wants someone who can give its business a little prompter attention than I have been able to give it. I know that I am doing right by the Association and by myself. I thank you, sir, very much, for your kindly suggestion that I withdraw my resignation, but at the same time I must allow it to stand.

The President—You have heard the motion, moved by Mr. H. H. Gibson, and seconded by Mr. Van Nostrand, that the resignation of the Secretary be accepted. All those in favor of the motion, please signify it in the usual manner. I declare it carried.

Mr. Van Nostrand—The election of officers will be held almost immediately, and I think we might allow the Secretary's office to remain open for the short time until that order of business is reached.

Mr. P. S. Gibson—A great deal depends upon our being exact. Mr. Sankey has been a very exact man. Mr. Van Nostrand also received the same training. Captain Gamble, here, is also a military man, and a highly esteemed professional man, who has been well trained in every way, and I beg leave to nominate him as Secretary, to succeed my friend Mr. Sankey.

Seconded by Mr. Kirkpatrick.

The President—As President of the Association, I have heard this motion with a great deal of pleasure, and I would have been only too happy to have made the motion if my official position here did not place it beyond my power. Does any person here wish to make any further remarks?

It has been moved and seconded that Captain Gamble be elected Secretary-Treasurer of the Association for the coming year. All in favor, signify their approval. I declare it carried unanimously.

Allow me to congratulate Captain Gamble upon his unanimous election to this office. I am sure, Captain Gamble, you will make a first-class officer, as good as your predecessors, and that is saying a good deal.

Captain Gamble—Mr. President and Gentlemen, I feel very highly honored indeed by the confidence you have reposed in me, in expressing your desire that I should take up the duties of Secretary-Treasurer of the Association, duties which I know my predecessors have performed with so much ability and courtesy that I feel much diffidence in undertaking them, but I shall do all in my power to satisfy the members of the Association, and shall try to fulfil the duties of the office to the best of my ability. (Applause.)

Mr. Van Nostrand—I would move that the Secretary Treasurer be paid the sum of two hundred and twenty-five dollars for his services during the past year.

Mr. E. T. Wilkie—I have much pleasure in seconding that motion.

Mr. Van Nostrand—We see certain figures before us, and we may think it represents a certain sum. In this case it does not. From my own experience, I know that there are certain liabilities upon the part of the Secretary-Treasurer incurred in connection with the Association, that have to be defrayed, and that there will be a very considerable reduction in that sum before his own net portion is realized.

The President, having put the motion to the meeting, declared it carried.

Mr. Sankey—Mr. President and Gentlemen, allow me to thank you most cordially for the vote which has just been passed.

In undertaking the duties of Secretary-Treasurer I did not consider what I might expect from the Association. I hoped to carry on the work successfully. Of course I have had a good deal to do with the organization of the Association, and to a certain extent I was familiar with the work; but it was not a case of how much there was in the way of salary or honorarium for the work. Allow me to thank you most sincerely for your kindness, and to assure you that in the future I hope to have an opportunity in some way or other, of doing what I can to assist the Association. I do not want it to be thought for one minute that in retiring I am going in any way to turn my back upon the Association.

The President—I suppose the next business is the election of a President.

Mr. Van Nostrand—We have not yet dealt with the Report of the Secretary-Treasurer, and I would move that the verbal report of the Secretary-Treasurer, as reported by the stenographer, be adopted and printed in the Proceedings.

Seconded by Mr. E. T. Wilkie.

The President having put the motion, declared it carried.

Mr. P. S. Gibson—I move, seconded by Mr. G. B. Kirkpatrick, that the auditors elected at this meeting be instructed to complete the work of auditing the accounts of the Association, and report the same to the Council of Management at the next regular meeting of that body, such report to be printed in the Proceedings of this Association for the current year.

The President, having called for the votes of the members, declared the motion carried.

The President—The next business is the election of a President.

Mr. Kirkpatrick—I would move that Mr. W. R. Aylsworth be elected President for the ensuing year. I believe it an established rule that the President hold office for one year only.

The President—Yes, and a very proper rule it is, too, I think.

Mr. Kirkpatrick—I think you all know Mr. Aylsworth, who is an old member of the Association, with the interests of the surveying profession at heart, and I believe you will all agree with me, that he will make a very good President for our Asso-

ciation, and I therefore beg leave to move his election to that office.

Mr. H. H. Gibson—I take great pleasure in seconding this motion. I have always taken a deep interest in any remarks made by Mr. Aylsworth. He seems to be a man of deep thought, who looks at everything in a very practical manner, and we want such a man at the head of our Association.

The President—If there are no other nominations, I put the motion, and declare it carried.

I think I may congratulate the Association upon having a better President for the coming year than they have had for the past year.

Mr. Van Nostrand—I take great pleasure in nominating Mr. C. A. Jones, now of Petrolia, for Vice-President. I know him to be a very earnest member of the Association, and I am sure he will do credit to this office and to the office to which he will succeed in usual course.

Mr. Sankey—I take great pleasure in seconding that motion.

The President having put the motion declared it carried.

The President—There are three members of the Council wanted. Those now retiring are Messrs. Kirkpatrick and Niven, whose term expires in April, 1902. It is usual to nominate quite a number for this office. The Council will nominate one in place of Mr. Jones, at the next meeting.

Mr. Gibson—I beg to nominate Mr. Kirkpatrick.

Mr. Kirkpatrick—I beg to nominate Mr. Niven.

Mr. Van Nostrand—I beg to nominate Major Sankey. I think we need his services now as much as ever we did.

Mr. Sankey—Mr. President and Gentlemen, I do not want my name to go before the Association unless it is really thought that I can be of some service. I have been on at almost all the elections, and new blood is wise. I would sooner be allowed to withdraw, and not have my name go to the ballot.

Mr. Van Nostrand—It is only in self-defence that I nominate Mr. Sankey, because it is only following the course that was pursued when I resigned the Secretary-Treasurership. I know Major Sankey has been familiar with the workings of the Association, and is in a great measure responsible for the good standing in which we find ourselves, and I think he should be elected.

Mr. Selby—I would nominate Mr. H. H. Gibson.

Mr. Sankey—I nominate Mr. DeMorest, of Sudbury.

Mr. Gibson—I beg to nominate Mr. Wilkie, who is a good man.

Mr. Van Nostrand—And I have much pleasure in nominating Mr. Selby, a gentleman who represents the far west end of this Province.

The President—If you have no more names to put in nomination for this office, we will bring this order of business to a close.

Mr. Van Nostrand—For auditors, I beg to nominate Mr. J. F. Whitson and Mr. H. J. Brown. Carried.

Mr. Kirkpatrick—The President appoints the scrutineers.

The President—Then I would name Mr. J. F. Whitson and Mr. W. A. Maclean as the scrutineers.

Now you want a Legislation Committee.

Mr. Van Nostrand—In our Standing Committees I think there has been no provision made for a Committee on Legislation, but we have found that it was a very necessary thing, to have a Committee of that kind. It was dropped from the old Association because it was supposed that there was to be no further work for such a Committee; but I think it is high time that we appointed a Committee of good men to attend to any matters of legislation which may affect the Ontario Land Surveyors collectively or individually. I would suggest that this Association appoint a Committee to act during the ensuing year, and so move.

Mr. Sankey—I think, Mr. President, that Mr. Van Nostrand has made a very wise motion. The last session and the session before of the Legislature, there was a question of who could officially express the feelings and thoughts of this Association. As a matter of fact, I suppose we had to do as individuals whatever was done. With a Legislation Committee, the Committee would be able to voice the sentiments of the Association at large, and I think a good representative Committee is a step in the right direction.

Mr. Van Nostrand—Then I would move that Messrs. Sankey, Kirkpatrick, P. S. Gibson, H. J. Brown, C. A. Jones, and W. R. Aylsworth, be a Special Committee on Legislation for the ensuing year, and that the first named be Convener.

Seconded by Mr. Wilkie. Carried.

Mr. H. H. Gibson—I have a motion here which I desire to make: That any omissions or clerical errors in the records of this meeting now in the hands of the Secretary and stenographer be corrected by the Committee on Publication before being printed.

Seconded by Mr. W. S. Gibson. Carried.

Mr. H. H. Gibson—I move that the Report of the Committee on Entertainment be made to the Council, and received by them and printed in the Minutes of Proceedings.

Captain Gamble—I second that motion, that the report of the Entertainment Committee be taken as read and printed in the Proceedings. Carried.

Mr. G. B. Kirkpatrick—Mr. President, I move that you leave the chair, and that Mr. P. S. Gibson take it.

Seconded by Mr. Van Nostrand. Carried.

Mr. Kirkpatrick—Mr. Chairman, I do not want to move a formal vote of thanks to our retiring President, but I do want to move a cordial vote of thanks, without any mere formality, as a real expression of our kindly feelings towards him. We have all known him for a very long time. He has worked in the interests of our profession and of our Association, and I think you will all agree with me in according him our hearty thanks for his services as President during the year. I have much pleasure in moving this motion.

Mr. Sankey—Mr. Chairman, I have very great pleasure in seconding the motion that has just been made. It is now a good many years since I had the pleasure of working for Mr. Dickson out in the bush. I think outside of the Toronto Surveyors he was the first Surveyor I knew. Nothing has given me so much pleasure as seeing Mr. Dickson coming and taking an interest in our Association.

I do not wish to be personal, but I think when members of the profession and others whose names I need not mention now, of Mr. Dickson's standing, are seen desiring to advance the interests of the Association, outsiders must have a higher appreciation of the Association. Such men taking an active interest in the Association gave it a standing and prestige, so that the public could not say, ', Oh, they are a lot of hot heads trying to push themselves to the front." I am sure we ought to

be very proud indeed that we have such members, who have not only joined our Association, but have acted upon our Boards. I am sure that in the future we shall see Mr. Dickson as regular in his attendance at our meetings as he has been in the past.

Mr. Gibson—You have heard the remarks of the mover and seconder of the motion, that a cordial vote of thanks be given to our retiring President, Mr. James Dickson, for the good will shown and the masterly manner in which he has conducted the business of the Association during his term of office as President. All in favor manifest their approval. I declare it carried unanimously. (Applause.)

Mr. President, allow me to convey to you the thanks of the Association for the manner in which you have conducted the business during the past year.

Mr. Dickson—Mr. Chairman, I am sure I thank you very much for the kind manner in which you have spoken, and especially I thank my friends Mr. Kirkpatrick and Mr. Sankey for the very kind words which they have uttered in my behalf. I only feel that perhaps I did not do all that I might have done for the Association. As I said last evening, when the first Association was talked of being formed, I went into that; but it broke down, and then I felt a little doubtful about the new organization, until I received a letter from Mr. Kirkpatrick. Since that I have never regretted having joined the Association, or paying my fees from year to year or the outlay necessary for attending the Annual Meeting. I think it gives us all more confidence in ourselves and in each other than we had before we came together. There is no question about who will do his work cheaper than another but who will do his work best.

I want the whole public to feel that every Ontario Land Surveyor is a good Surveyor, and that as far as ability and integrity go, there is no choice in the matter.

There is one thing I have heard with regret, and that is, that so many of my predecessors in office, after they have been in office once or twice, have seemed to lose all interest in the Association, and have left off attending. I do not know whether I shall do much better, but if I am able to carry out my present intentions, I shall be with you in the future as much as I have in the past. If I can be of any assistance to any other Surveyor, I shall be only too happy to do what I can. I have often had to

go to other members of the profession for advice and assistance, and have never had one refuse me.

I thank the members of the Association very heartily for their kindly vote of thanks.

Mr. Gibson—If there is no further business to come before the meeting, I suppose a motion to adjourn will be in order.

Moved by Mr. H. H. Gibson, and seconded by Mr. Wilkie, that the meeting do now adjourn. Carried.

PRESIDENT'S ADDRESS.

Gentlemen,—It affords me very great pleasure to greet you once more at another of our annual gatherings, the tenth since incorporation.

We can congratulate each other, and also the whole community, on the prosperous condition of all branches of industry, a condition which has prevailed all over the Dominion during the past twelve months. A condition which all indications tend to show is likely to continue.

It is to be regretted that so few members of the profession take advantage of our annual meetings. Our exchange of experiences, views, and the opinions of our professional brethren on the various knotty problems which we are one and all frequently called upon to solve in our practice are alone worth vastly more than the outlay incurred in attending.

On the first of July last year there were 196 active members of the profession in the Province who pay their annual dues of $4 each. There are also 19 members who, although still practising, are exempt from the payment of dues, and, including associates, 69 who purport to have withdrawn and ceased to practise in Ontario. Of the latter class, 23 are still residents of the Province, making a total of 238 active and retired surveyors alive in the Province on that date, and of those there were only 38 at the last annual meeting.

It is only at rare intervals that there are any from east of Belleville or north of Orillia present. And there are a number of surveyors within a few hours' run of the place of meeting who never put in an appearance. So that geographically speaking, only a small part of the Province is ever represented at all.

I would gladly draw the attention of our professional brethren who reside outside the city to the Engineers' Club of Toronto, and would be pleased to see them become members. I think it is to our advantage to have, when in the city, some place, conveniently situated as the Club's rooms are, where we can go to meet with and pass a social hour with kindred spirits, and keep alive a fraternal feeling between our kindred associations.

One or two cases of surveyors having signed plans for registration without the field work having been performed under their personal supervision, have been brought to the attention of the Council during the year. Also a case of one surveyor employing a man who understood how to use an instrument to do field work for him, while he was engaged professionally elsewhere. The Secretary will be able to lay those cases more fully before you.

There is one case of flagrant unprofessional and illegal conduct to which I would invite your particular attention, and which should be both sharply and promptly dealt with. It is a case of a surveyor who, five years ago, made application to our Secretary to have his name placed on the retired list. He has never applied to be reinstated on the active list, or paid any fees, but has been, and is still, in the active practice of his profession.

If such conduct cannot be, and is not put a stop to, our Association, its aims and objects, must soon become a complete failure.

There is another matter which I think our Association should take up and endeavor if possible to have something like uniformity in throughout the Province, viz., the tariff for our professional services.

Both the legal and medical profession have a regular scale of charges, while in different parts of the Province surveyors' charges vary all the way from $4 to $10 per diem.

A surveyor has to go through as severe a course of study and spend as many of the best years of his life, as either a lawyer or a doctor before he can attain his degree, and after he commences to practise, his life is infinitely harder. Yet even if he has constant employment, his gross earnings are a bagatelle to those of either of the other two professions.

I know of one case where an Ontario Land Surveyor recently accepted the position of engineer for one of the richest townships in Central Ontario, his pay to be $4 per diem for each day he worked, but nothing for his time either going to or returning from the work.

When surveyors are in the employ of the Ontario Government, they are paid $7 per diem, and fifty cents per diem for ration allowance. When employed by the Federal Government, the allowance is $6.50 per diem and $1 per diem for rations. In both cases they are allowed pay and rations, Sundays included, for every day they are absent from home, also all travelling expenses.

I do not know whether our Association has the power to fix any legal tariff below which no one could go, but I should like to hear the matter discussed, and an endeavor made to at least awaken such an esprit de corps as would prevent anyone from working below the figure charged by other surveyors in the same locality.

I have to congratulate our Secretary-Treasurer for the good, and varied, program, he has presented for this meeting. If it is all carried out the meeting will be both interesting and instructive.

JAMES DICKSON,
President.

DISCUSSION.

President Dickson—The question of unprofessional work I think is a thing we should deal with and deal with very promptly. I expect to meet the gentleman referred to in court next week—he has been there already and stated he was a duly licensed practising Land Surveyor. As I understand the law, I was under the impression that no man could practise who had not paid up his dues regularly and got his annual certificate. Perhaps some of you gentlemen may be able to give some light on this subject.

Mr. Kirkpatrick—I never knew that there was any difference of opinion; I think the Act provides that no person can act as a surveyor in Ontario unless he is a registered member of the

Association. Another clause enables a man to withdraw from active work, and then he is placed on the withdrawn list. Then another clause shows how he can again get on the active list. It seems to me perfectly clear that all the different subjects are provided for by the Act; and if this gentleman withdrew under the impression that he was not going to practise, he was perfectly within his rights. Then, if he is employed to make a survey he has two doors open to him: one is to say, I am not practising, you must go to one who is practising; the other is to put himself in a position to accept the work. How a surveyor should undertake to say, I won't comply with the law, and I will practise, is one of those things that I don't understand. I could understand a few years ago, when we were first incorporated, the old surveyors saying, We have been admitted as surveyors, we have never joined the Association, and we think we ought to go on and practise. That was discussed fully at the time the Association was formed, and nearly all the surveyors joined the Association; in fact, I think there was only one who did not, and he was not in the active practice of his profession; he never registered, and the consequence was he was not really an Ontario Land Surveyor. Some eight or nine years after the Association was formed he made a survey and sent in a plan of his survey to the Department; and the party for whom he made it brought the plan to the Department and wished to get a patent through, as it was of great importance to him that he should. I pointed out to him that the gentleman was not a registered Ontario Land Surveyor—he hadn't signed the plan as an O.L.S., but he had signed it as a D.L.S. We all know that D.L.S's. are not entitled, *per se*, to practice in Ontario, they are only entitled to practise in the Northwest Territories; they cannot practise in Manitoba nor in British Columbia, and there is only a portion of the Northwest Territories outside of these Provinces where the D.L.S's. can practise. The effect of this was that the party who brought the plan up, rather than delay, paid this surveyor's fee for registration for that year, and then that surveyor became a registered Ontario Land Surveyor and his plan was accepted. I did not hear what the result was, or if this gentleman on his return got paid, but I naturally supposed that he got his refund of $5 that he had paid. The present instance is practically a more flagrant one that that, because in this instance the gentleman cannot claim ignorance of the law which he did not comply with; he knows what

the law is, and he apparently, judging from the president's remarks, laughs at the law and says, I am a law to myself.

President Dickson—That is just about what it is.

Mr. Kirkpatrick—I understand when a man goes into court the first question asked is, "Are you a registered Land Surveyor, entitled to practise?" and if he says, "Yes," I suppose he would be asked, "How? what is the law?" and if the law is read it seems to me the judge would have to say, "The law has not been complied with in this case, and I cannot receive your evidence.

President Dickson—When this matter was referred to me I looked up the register in our council report, and I found he was on the retired list; I then got the particulars from our Secretary and I saw our solicitor, and brought it to his attention; I wanted him to bring the matter before the judge and to challenge this man's right to practise, or to ask the judge to refuse to receive his evidence as a land surveyor. Our solicitor seemed to be afraid to do so for fear the judge might not take that view. However, I propose to have him challenged when he is called. I never had any doubt myself that he was not a legal surveyor, but I thought there might possibly be a loophole through which he could escape.

Mr. Van Nostrand—On what ground had our solicitor doubts? Was it on the ground that he was a Land Surveyor, or was it that it was not a qualified Land Surveyor's work?

President Dickson—He was afraid the judge might not hold that this man was not entitled to act.

Mr. Wilkie—Down where I live, I have to work against a man like that; he registered when the Act was passed in 1892, and then he refused to pay any dues; after letting it run some years a compromise was made in some way, and while he was endeavoring to get his compromise he was still practising, and he is still practising. I have come in contact with him frequently, and I have told him he is not a legal practitioner; but he laughs at me. I did not intend to say anything about the matter I am going to refer to now until I heard Mr. Kirkpatrick speak of someone coming before the Department; in the last meeting of the Lanark County Council there was a request put in to have a survey made; I had been over part of it before, and Mr. Moore, of Smith's Falls, had been over it. The council did not wish either of us to do it; they wished this person I

speak of to do the work; and last Monday he told me that he had received instructions from the council. As to going into court and being asked if you are a surveyor, the question usually put to me is, "Are you a Provincial Land Surveyor?" and I say, "No." Then I have got to explain. It seems to me the lawyers do not know the law, that they do not know that there is no such thing as a Provincial Land Surveyor for the Province of Ontario. In reference to this man, who is an unlicensed practitioner, I had intended if a case came into court to object and say he was not qualified, but I have never got a chance yet; I may some day.

Mr. Kirkpatrick—The gentleman to whom Mr. Wilkie alludes has paid his fees and is fully entitled to practise.

Mr. Wilkie—He has done it very recently.

Mr. Kirkpatrick—It was done last year; I know this, because I looked into it.

Mr. Wilkie—He denied it to me.

President Dickson—I would suggest that the Secretary on or about the 30th May of each year furnish every Registrar of the Province with a list of the duly qualified men. A man may go to a county where he is not known and make a survey, and if the Registrar does not know he is not licensed he may take the plans and register them; of course he cannot receive a plan from a man who is not a registered practitioner. It is bad enough for a man who is not in the profession to take the work from us, but it is infinitely worse when one of our own men is guilty of such unprofessional conduct as has been spoken of here now.

Mr. Henry Smith—Was this man of whom Mr. Wilkie has spoken originally a Provincial Land Surveyor? Had he passed an examination?

Mr. Wilkie—Yes, he passed. He was a man of over sixty years of age. He was registered, and then withdrew.

Mr. Aylesworth—I generally answer the question that Mr. Wilkie says is put to him, "Are you a Provincial Land Surveyor?" by saying, "I am." I think our Act says that "Ontario Surveyor" includes or covers "Provincial Land Surveyor," and I do not think it is necessary to go into an explanation; but, however, that is a matter for individual opinion, I suppose.

A difficulty strikes me in connection with sending a list at a certain time of the year, because it seems the practice is, if a man has not paid his fees when he ought to pay them, that he may pay them any time afterwards when he wants to practise, so that the list if issued in May or June might not be complete, and it would be a good deal of work to the Secretary to have to send additional notices to all the Registrars of the Province conveying the information that since the last list such a man has paid his dues and was now entitled to practise as an Ontario Land Surveyor.

It strikes me there would be a little technicality about the case Mr. Kirkpatrick refers to, where the man had done the work and paid up his dues afterwards.

Mr. Kirkpatrick—He has not done the work yet.

Mr. Aylesworth—I understood Mr. Kirkpatrick to say that the man had done the work, then he was put on the list afterwards.

Mr. Kirkpatrick—He paid up for the full year.

President Dickson—I think the fees should be paid before he does the work.

Mr. Aylesworth—I think it should be paid before a stated time or he should be barred for the remainder of the year.

Mr. Sewell—It is a question whether the fee is necessary to fully qualify.

Mr. H. H. Gibson—Then if any of us did work before we paid the fee for the year it would be illegal work?

Mr. Aylesworth—If there was a time fixed before which fees should be paid it would be convenient to have a list published in the Canadian Almanac, which almost everybody gets, and then the public would know what now they do not know; there is no official record, unless they apply to the Secretary, and a great many do not know where or how to apply to him.

Mr. H. H. Gibson—If you had the names published in July it would be a very good time; they ought to know then whether they were going to have a summer's work or not.

Mr. Van Nostrand—I think the Statute provides for the publication of a list.

Mr. Aylesworth—But the general public does not get that list. We were talking of some scheme by which the general public would have access to that list and would know it.

President Dickson—There was a case last spring brought to our notice of a surveyor so peculiarly situated and in such poor health that he could not do any work, and he asked to be relieved, and we relieved him.

Mr. Aylesworth—That was an old man; he was an old surveyor and was doing but little—he has done some work since. I think that I made the motion that he should be relieved.

I agree with some of the statements the President has made, and would back him up in some of his suggestions; some other suggestions contained in his address I do not think practicable. On the whole I am very well pleased with the President's address.

President Dickson—The House never agrees wholly with the Speech from the Throne.

Mr. Aylesworth—There may be opposition to it.

NOMINATION AND ELECTION OF OFFICERS.

PRESIDENT.

Mr. Kirkpatrick moved, seconded by Mr. H. H. Gibson, that Mr. W. R. Aylsworth be President for the ensuing year. Carried.

VICE-PRESIDENT.

Moved by Mr. A. J. VanNostrand, seconded by Mr. Sankey, that Mr. C. A. Jones be Vice-President for the ensuing year. Carried.

SECRETARY-TREASURER.

Moved by Mr. P. S. Gibson, seconded by Mr. G. B. Kirkpatrick, that Captain Killaly Gamble be Secretary-Treasurer. Carried.

AUDITORS.

Moved by Mr. A. J. VanNostrand, seconded by Captain Killaly Gamble, that Mr. H. J. Browne and Mr. J. F. Whitson be Auditors. Carried.

MEMBERS OF COUNCIL.

The following were nominated for Members of Council: Messrs. G. B. Kirkpatrick and A. Niven, Major Sankey, Messrs. H. H. Gibson, R. W. DeMorest, E. T. Wilkie, H. W. Selby.

SCRUTINEERS.

Messrs. H. J. Browne and J. F. Whitson were appointed Scrutineers for the ballots.

Moved by Mr. VanNostrand, seconded by Mr. Wilkie, that the Secretary-Treasurer be paid the sum of two hundred and twenty-five dollars as a slight mark of appreciation on the part of the Association for his services as Secretary-Treasurer during the past year. Carried.

Moved by Captain Gamble, seconded by Mr. VanNostrand, that the sum of $5 be paid to each of the Auditors on completing their work of auditing the accounts for the past year. Carried.

Moved by Mr. Kirkpatrick, seconded by Mr. P. S. Gibson, that the Association has heard with deep regret of the loss by death of the following members of the profession since the last Annual Meeting of the Association : William Wagner, Jesse Nunn Bolton, Tom Kains.

REPORT OF PUBLICATION COMMITTEE.

Mr. President,—As far as the matter for publication was within the control of your Committee, we had attended to the proof-reading and returned the proof-sheets to the printers before the 1st July, 1901. There were a few pages of copy which we were then unable to procure, and these were not available until long afterwards, hence the unusual delay in the issue of our Report. Messrs. Henderson & Co., our printers, were very obliging, although our tardiness caused them considerable inconvenience.

Thirteen hundred and fifty copies of the Report, and also 200 copies of list of members and 200 copies of extracts from by-laws and statutes, were printed, at a cost of $342.88.

Provision was made for sending in exchange to the following societies the subjoined numbers of copies of the Report.

School of Practical Science, Engineering Society	200
Michigan Engineering Society	130
Ohio Society of Surveyors and Civil Engineers	100
Illinois Society of Engineers and Surveyors	130
Indiana Engineering Society	75
Iowa Civil Engineers' and Surveyors' Society	70
Wisconsin Engineering Society	20

Respectfully submitted,

Killaly Gamble,
Chairman.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

Mr. President,—Your Committee on Repository and Biography beg leave to report as follows:

Since the Annual Meeting of the Association in 1901 several additions to the furniture and equipment of the rooms set apart for the use of the Association have been made, and the library has received its annual contribution of reports and periodicals.

The rooms have been found to be all that can be desired for the various uses to which they have been put, namely, the meeting of the Board of Examiners,the meetings of the Council of Management and Standing Committees, and as drafting rooms for those members who have occasion to do work of that nature in connection with the records in the Department of Crown Lands.

Your Committee would invite the attention of all interested members to the fact that the library shelves possess sufficient capacity to accommodate the generosity of those who may feel disposed to contribute works of interest to the profession.

Some years ago one of our most active members expressed his intention of making the Association, through its repository, the sole beneficiary in his will, so far as the technical part of his library is concerned.

What better disposition could be made than that? We all know that books of great value are scattered and wasted in the majority of instances where the natural heirs of a specialist have chosen a different walk of life, when, if disposed of in the manner suggested, they would not only continue to serve a useful purpose, but in addition, would become a monument to the memory of the testator.

The usual reminder that the collection of autobiographies and photographs is far from complete is again tendered, and those who have hitherto neglected this matter are requested to give it their early consideration.

All of which is respectfully submitted,

A, J. Van Nostrand,

Chairman.

DISCUSSION.

Mr. Kirkpatrick—I think the chairman is entitled to a vote of thanks for that neatly worded sentence in which he draws attention to the fact that the shelves have room for additions; it couldn't be improved on. I hope it will appear in full. I will second the motion.

Mr. H. H. Gibson—Have we any means provided to record the number of visits made by members of the Association to those rooms, to show how they are used?

Mr. Van Nostrand—No, there is nothing of that kind now, but it could be very easily arranged.

Mr. H. H. Gibson—It would be very interesting to know how the rooms are used.

Mr. Van Nostrand—We could keep a visitor's book.

Mr. Kirkpatrick—I do not think a week has passed without some member of the profession using the rooms.

I would like to ask through the Chairman what Mr. Van Nostrand does with these biographies when he gets them. He does not publish them.

Mr. Van Nostrand—They are preserved, and they will be published when the subject is moved to a higher sphere and canonized.

Mr. H. H. Gibson—Is it intended that all the surveyors should send in their photographs?

Mr. Van Nostrand—Yes; we have quite a large collection already.

REPORT OF COMMITTEE ON POLAR RESEARCH.

Mr. President,—Early in January, the Chairman of the Committee wrote to Capt. J. E. Bernier at Ottawa, with the object of engaging him to deliver a public lecture upon Polar Explorations at the time of the Annual Meeting of the Association. We were not aware that he was then in England on business connected with his proposed expedition, until we received his reply regretting he could not be with us.

Next year we hope to be more successful.

Lieutenant Peary returned to Greenland in the summer of 1898, to make his final struggle for the Pole. He took with him but two companions, Dr. Dedrick and Matthew Henson, his colored body-servant. The explorer established his headquarters at "Etah," the most northern point that can be conveniently reached by ships.

From "Etah" Peary laid a line of supplies to Fort Conger, of Greely fame.

He has practically completed the survey of north-east Greenland, and succeeded in reaching latitude 83° 50′ north.

Early in September, 1901, the relief steamer "Eric" returned from "Etah," bringing Mrs. Peary and daughter, but Lieutenant Peary remained in Greenland to make another attempt for the Pole.

Minerals of great value may be discovered in these northern regions any day. Within the memory of many of us, our whole North-West Territories, including Manitoba, were looked upon as worthless for agricultural purposes, a desert wilderness; and ten years ago the Yukon District was considered as valueless. These are lessons from which we should profit.

Willis Chipman,

Chairman.

REPORT OF ENTERTAINMENT COMMITTEE.
1901-02.

MR. PRESIDENT,—Your Entertainment Committee for 1901-02 beg to report as follows: The duties of this Committee consisted in arranging for the seventeenth Annual Dinner of the Association, which was held at McConkey's Restaurant, Toronto, on the evening of the 19th of March, 1902. Although the actual number of members in attendance at this function was not quite so large as on some previous occasions, owing doubtless to the number absent on account of professional engagements in other parts of the Province, yet the occasion was one well to be remembered and was enjoyed by all.

The chair was as usual taken by the President, and the vice-chair was occupied by the Vice-President, and, after dinner, the following programme was carried out: Toast, "The King," God Save the King; "Canada and Ontario," proposed by the President, responded to by Messrs. Otto Klotz, for "Canada," and Dr. Kennedy and Mr. Southworth, for "Ontario;" toast, "Sister Societies," responded to by Mr. MacMurchy, for the Law Society, Mr. Hertzberg, for the Canadian Society of Civil Engineers, and Major Gray, for the Engineers' Club of Toronto; toast, "Municipal Institutions," responded to by Mr. John Jones. Afterwards, volunteer toasts were in order, interspersed with musical selections. The evening passed quickly, and when the company dispersed with "Auld Lang Syne" and "God Save the King," all present seemed to think that the annual gathering of 1902 had been, as usual, a grand success, and had brought the members of the Association into more intimate personal relation with each other than ever before.

The following were in attendance: President James Dickson, Vice-President W. R. Aylsworth, Dr. Kennedy, Major Gray, Angus MacMurchy, A. L. Hertzberg, Geo. Ross, G. B. Kirkpatrick, F. T. Wilkie, J. G. Sing, H. L. Esten, C. M. Canniff, Thos. Southworth, A. J. VanNostrand, G. L. Brown, H. S. Hol-

croft, H. W. Selby, R. A. Gledhill, Jno. Jones, Otto J. Klotz, A. P. Walker.

A statement of receipts and disbursements has been filed with the Secretary-Treasurer.

A. P. WALKER,
Chairman.

NOTE. — On account of copy being received too late for insertion with other Reports, the Engineering Committee's Report will be found on Page 140.

Discussions.

ENGINEERS' BILL.

Mr. Sankey—I think perhaps the best way to bring this matter up would be to give a short history of it from the time it was first brought to our notice. In 1899, a Bill, number 136, was presented by Mr. Russell to the Ontario Legislature, entitled "An Act respecting Civil Engineers." The Act or Bill recited that they were an incorporated society by virtue of an Act of the Parliament of Canada; then it went on to define certain interpretations of the Act. It defined the society, and the council, and what a corporate member was, and what the expression Civil Engineer meant. Perhaps I had better read that clause, as I understand it is taken out of their Dominion Bill: "The expression Civil Engineer means any one who acts or practises as an engineer in advising on, in making measurements for, or in laying out, designing or supervising the construction of canals, aqueducts, drains, harbors, docks, lighthouses, river improvements, dykes, dams, railways, bridges, power plants, waterworks, sewerage works, and all hydraulic, municipal, sanitary, electrical, mechanical or other engineering works, when the estimated cost of such works exceeds one thousand dollars."

Then clause 2 said, "On and after the first day of July next, no person shall be entitled, within the Province of Ontario, to use the title of "civil engineer," or any abbreviation thereof, or any name, title or description implying that he is a corporate member of the said society, nor to act nor practise as a civil engineer within the meaning of the first section of this Act. . . ."

Sub-section (c) of that clause is the one that referred to Ontario Land Surveyors: "Unless he has been practising as a civil engineer for at least one year, or is a member of the Association of Ontario Land Surveyors at the time of the passing of this Act, and shall have within one year afterwards applied for and received from the Board of Examiners, as constituted

in this Act, a certificate to the effect that he is qualified to become a corporate member of the society. The applicant must send with his application a fee of ten dollars to the secretary of the society.

Section 3 provides that "Any person, not being a corporate member of the society, who qualifies to become such under the last preceding sub-section, may at any time hereafter become a corporate member of the society upon application to the secretary, which application shall be accompanied with the prescribed dues for the year in which such application is made, and until he becomes a corporate member he shall not be subject to dues."

Following that was Section 4, as follows: "A Board of Examiners, consisting of five persons, who shall be appointed by the council, shall be constituted to examine candidates for admission to the study and for admission to practise as civil engineers." The board was to meet in Toronto; and special meetings of the board might be called by the chairman. The council could call in competent persons to assist the board of examiners in any of the subjects of examination, and could fix their fees, etc.

The next section went on to point out how a candidate for admission to study should proceed, the examinations he had to pass, and the fees he had to pay. For the privilege of going up for his preliminary examination, he had to pay the secretary a fee of twenty dollars.

"If the candidate holds a certificate of having been admitted to study as an Ontario Land Surveyor, at the time of the coming into force of this Act, then such certificate shall be accepted in place of the foregoing examination.

"If the candidate holds a degree of Bachelor of Applied Science, Bachelor of Arts, Bachelor of Sciences, conferred upon him by any Canadian or British university, or is a graduate from the Royal Military College of Canada, Kingston, or holds a certificate as Ontario Land Surveyor in this Province, he shall, on making satisfactory proof that he is the person named in such degree or certificate, be entitled, on payment of the above mentioned fee, to receive a certificate permitting him to study."

Further on, in section 6, it shows how a person was to become a corporate member after the passing of the Act: "Establish that, since his admission to study, he has been engaged

in the practice of engineering in the office, or in the service of, a corporate member of the society for a period of at least five years, or for a period of two years if he holds a certificate as an Ontario Land Surveyor, or if he has a degree from any college or university in Canada granting degrees or diplomas in applied science, where the course of study has not been less than three years, or from the Royal Military College of Canada, Kingston, or from any similar British or foreign college or university satisfactory to the board of examiners. The time occupied during such college vacation in actual engineering work, under the direction of a corporate member of the Society, shall count in the computation of the term of two years above mentioned."

The other sections refer to the duties of their several officers and things of that kind, with which I need not take up your time, until we reach section 13, which provides that: "No person practising the profession of civil engineer, and not entitled to do so under this Act, shall recover before any court of justice any sum of money for the professional service rendered in such practice." Then section 14: "Any person who takes or makes use of any name, title or designation as mentioned, or assumes the title of civil engineer or practises as a civil engineer without being entitled thereto by this Act, shall be liable upon summary conviction, to a fine not exceeding $25 for the first offence, and $100 for every subsequent offence."

The last clause, which affects the members of our Association, is section 15: "Nothing in this Act shall be deemed to encroach upon the rights and privileges conferred upon Ontario Land Surveyors by any Act of the Legislature of this Province."

That, gentlemen, was the Bill as brought up in the House in 1899. That Bill, as some of you will remember, was referred by our Association to a Committee composed, I think, if I remember aright, of Mr. Niven, Mr. Kirkpatrick, myself, and Mr. Wilkie, or Mr. Morris, I am not certain which. We met a Committee of the Engineers, the result being that the Bill number 136, as amended, was agreed to by us.

The first change we made was in sub-section (c) of section 2, which read when we agreed to it, "Unless he is a member of the Ontario Land Surveyors' Association at the time of the coming into force of this Act, who at any date thereafter, apply

for admission to and pay the subscription fees required under the by-laws of the society."

You will notice that in the present Bill the words "At any time thereafter" have been omitted, although possibly they may be implied. If the Bill had gone on, I think we should have asked to have those words put in. They might as well be in to make it sure and plain.

A matter that we did have something to say about was that the board of examiners, consisting of five persons resident in this Province, should be appointed by the council. Then, with regard to the pupils, if a candidate holds a certificate of having been admitted to study by the Board of Examiners of the Association of Ontario Land Surveyors, and gives satisfactory proof that he is the person named in such certificate, such certificate shall be accepted instead of the foregoing examination, and instead of the above fee—the twenty dollars which I spoke of—he shall be entitled, on payment of a fee of $2, to receive a certificate permitting him to study.

Then, with regard to those who became Ontario Land Surveyors after the passing of the Act, the clause read thus, as we agreed to it: "Establish that since his admission to study he has been engaged in the practice of engineering in the office, or in the service, of a corporate member of the Society for a period of at least five years, or for a period of two years if he holds a certificate as an Ontario Land Surveyor," etc. In other words, he would only have to serve his two years, and then pass one of the final branches in engineering at his option.

Then, in the revised Bill, clause 9, with regard to withdrawing and enrolling again, was inserted at our request.

These, gentlemen, were the additions and revisions that our Committee agreed upon in 1899, and that having been settled, the Committee and a great many of the members of the Ontario Land Surveyors' Association—probably a dozen or more—attended at the Private Bills Committee Room and signified their consent or their desire that that Bill should be passed.

If there was any objection on the part of any individual members of our Association, I never heard of it. As an Association, under those circumstances, we agreed that it would be wise for the Engineers to get incorporation in Ontario.

The Bill that was brought before the House at its last ses-

sion left out three of the five clauses that I have referred to: one clause, about Ontario Land Surveyors being eligible at the time of the passing of the Act; there is no provision for a board of examiners or an examination fixed for the Province of Ontario, at all; there is no clause for withdrawals, and for resuming practice again; and future surveying pupils or future surveyors get no privileges at all.

After consulting with some of the surveyors in Toronto, and having had some correspondence with others, I spoke to some of the engineers who were promoting the last bill, and told them that we expected those additions and revisions to be made. They said to me that personally they had no objection to them, but that if we wanted them inserted we had better see to it ourselves. We did not have to do that, for the Bill was withdrawn, not owing to any opposition that the Ontario Land Surveyors gave to it. I think that at this meeting we should come to some final conclusion.

Of course what I read as to the Bill of 1899, number 136, is not binding upon us now.

In a letter published in the press, signed by Mr. Keating, referring to the Bill of 1899, he said that owing to the great opposition of the Ontario Land Surveyors and Mining Engineers, the Bill was killed. I have not answered that statement in the public press, but I intend, the first time I see Mr. Keating, to explain to him that he has made a great error. He was not present at the meeting, and he may not know personally what did take place in 1899. It is quite clear that in 1899 we did not offer the oposition to the Bill that Mr. Keating has stated we did.

I think these are all the facts of the case, and I would like to hear what gentlemen who are practising as Engineers more than I am, have to say.

Mr. Sewell—I think the members practising as Land Surveyors would be satisfied to go on just as they are.

Mr. W. R. Aylesworth—I beg to move that this Association express its willingness that a Bill similar to the Bill introduced into the House in 1890 and as amended by the Committee of the Association of Ontario Land Surveyors, be approved for the Association of Civil Engineers of Ontario.

I got a copy of the Bill that was introduced at this last ses-

sion of the Legislature, and I looked it over, and I think I wrote a letter to our Secretary. I could not altogether take in what was meant by the Bill. It was much shorter than the former Bill, and covered a great many points that the Bill itself does not disclose the meaning of. I think it would have been an unfortunate thing had it passed the Legislature; but it did not, and, as I have understood from a considerable number of the members of the House, it had no earthly chance of passing. There were certain things in that last Bill that nobody could really understand without having access to the by-laws and constitution, etc., of the society that was seeking the Act. I would be quite willing, and, in fact, in favor of the Bill as introduced in 1899 and as amended by the Committee of this Association, being passed.

The President—Would you just put your motion in writing?

Mr. H. DeQ. Sewell—I think, myself, that we ought to oppose such a Bill, unless we are given equal privileges. We have been incorporated, and we have the rights of Engineers. Nobody else in the Province has such rights. We are the only ones who can make a survey for a railway. They have not got the right to survey a railway. Why should we go and give away our rights, which we have as a corporate body? Why should we have to pay fees to an institution which will be of no use to us, in order to do work which we only come in for occasionally? I think the whole Bill is thoroughly vicious, and that we ought to oppose it tooth and nail, from first to last, and I would move to that effect.

Mr. Jones—I would like to ask with reference to this Bill: Has there been any reason given why the Engineers should be incorporated in a society to protect themselves from any outside persons? Would it place us in any better standing or position than we at present occupy?

Mr. H. DeQ. Sewell—I think it places us in very much worse standing. In our Association we find it as much as we can do, sometimes, to pay four dollars as our fee. We would have to pay ten dollars in the new society. We may perhaps once in ten years have to do engineering work. We ought to be able and privileged to do engineering work whenever it turns up for us, and I do not think we ought to be bound, as we would be, under this Bill, if it is passed into law.

It seems to me it is a design to drive our profession out of engineering work.

Personally, I am not so much affected as the rest may be. I am an Associate Member of the Institute of Civil Engineers of England, and they have made a special exception for them, so that I am not speaking from a personal point of view. If this Bill was to pass at any time I could go and join them, now or hereafter, simply paying my fees and becoming a member, in spite of them. That is how I personally stand. But what I am considering is the probable effect of such an Act upon our profession as Ontario Land Surveyors, and I contend that we should be committing a very suicidal act if we allow this Bill to go through and become law, or if we allow it to go out that we are at all in favor of their Bill.

If they put in a provision that will allow the Ontario Land Surveyors to become honorary members of their Association, something like that might obviate the difficulty that at present I see in connection with such a Bill, and then we ought to allow them to have their Bill, otherwise I say that we should oppose the passing of such a Bill.

The President—You mean not as honorary members, but as real members.

Mr. Sewell—To put us on as members, without fees—whether honorary or actual members, as long as we are in good standing.

M. H. H. Gibson—There are, I think, many of our Surveyors who do engineering work and who would feel it a burden to pay yearly the fees demanded by that society, because their engineering work does not amount to enough to make it worth while on their part to pay these fees, and they would perhaps rather remain where they are at present, having the privilege of doing any engineering work that may come to them.

These fees would go towards putting up big buildings, and supporting a large library, all for the benefit of McGill College students—the society is an annex of McGill College.

Mr. H. DeQ. Sewell—Their institution goes outside of Ontario, there is no doubt about that.

Mr. Aylesworth—Mr. President, the Committee that was appointed by this Association were entirely satisfied with the Bill that was introduced in 1899, with the addition of the amendments then made to it; but as far as I know, there was no declaration by this Association; and it has been stated, and apparently

not only in Toronto, but in other places as well, that the Association of Ontario Land Surveyors was opposed to the incorporation in Ontario of the Society of Civil Engineers. I do not know that that is the case, and what I propose by the resolution is to declare our willingness that on reasonable terms the Engineers may get a Bill through, incorporating them in Ontario.

The President—Will any gentleman second this resolution: That this Association is willing that the Bill re Civil Engineers, introduced into the Ontario Legislature in 1899, as amended by the Committee of this Association, be passed by the Ontario Legislature at its next session, or any other Bill similar to the one above referred to, that may be made satisfactory to this Association?

Mr. George Ross—Who is to be the judge of what is satisfactory to this Association? Hadn't it better be referred to a Committee?

Mr. George Laing Brown—Mr. Chairman, for the sake of bringing this matter fairly before the meeting, I have much pleasure in seconding the motion.

The President—Then this motion having been duly moved and seconded, the subject is now open for discussion.

Mr. C. A. Jones—Mr. President, in hearing Mr. Sankey read over the Bill, it seemed to me that there would be some cases in which it would be a disadvantage to Ontario Land Surveyors; one instance I might mention, where it spoke of the different engineering works, it mentioned drains. A student in the future, after that Bill was passed, could not assume the title of Civil Engineer without spending two years in service after he had become an Ontario Land Surveyor, and he could not survey or lay out a drain that would cost more than one thousand dollars, because he was not a Civil Engineer. There is a great deal of our work, particularly in the Western district, drainage work. I may possibly be mistaken, but this is the view I took after hearing Mr. Sankey read the Bill over. If I am not right I would be very glad to be set right.

Mr. Sankey—Do you refer to a student of an Ontario Land Surveyor or a man working for him under his instructions in doing drainage work?

Mr. C. A. Jones—A student of an Ontario Land Surveyor.

Mr. Sankey—A student of an Ontario Land Surveyor, I presume, can do legally what his master tells him.

Mr. C. A. Jones—I mean after a student has studied and has then passed the final examination of the Ontario Land Surveyors, he would still have to study two years more before he could become a Civil Engineer?

Mr. Sankey—That is so, but all Ontario Land Surveyors, I understand, are at present entitled to act in connection with drains.

Mr. Aylesworth—Under the Ditches and Watercourses Act you canot take up any matter that costs more than one thousand dollars; but if Mr. Jones is referring to municipal drainage work, he will find in the Municipal Drainage Act that an Ontario Land Surveyor has a right to take the levels, make the plans and make the report, and do all that sort of thing, and this Bill proposes not to interfere with that right.

Mr. Jones—It is all right at present, and as long as there is nothing to interfere with an Ontario Land Surveyor going on with drainage work.

Mr. Sankey—Those works mentioned would catch the man who was not an Ontario Land Surveyor. If he is an Ontario Land Surveyor, no matter at what time he becomes such, under the Municipal Drainage Act he is authorized to do this work, and this Bill does not propose to do away with or interfere with the privileges of Ontario Land Surveyors. That is clear by section 15.

Mr. Jones—But something might crop up afterwards which would require an Ontario Land Surveyor to become a Civil Engineer in order to do drainage work. I fear that this would be getting in the thin edge of the wedge. I mean that we should look after the future.

Mr. George Smith (Woodville)—The Act says that they may employ any person who is competent. We are sailing under another name. The Engineer is simply called an Engineer, and signs his plan as a Civil Engineer. There is nothing said about his being an Ontario Land Surveyor, but the law calls for an Engineer. I cannot help thinking that there will have to be some safeguard round that point. We may do the work under the Municipal Drainage Act, but I think we will trip when we come to do work under the Ditches and Watercourses Act.

How is the public likely to look at it? They will say, "Oh,

he is not a Civil Engineer, he is only an Ontario Land Surveyor." I am not referring so much to the language of that section 15 of the Bill as to the question of how this whole matter will practically affect us in business. All that has to be said is, "Oh, this man is not a Civil Engineer, he won't fill the bill, he is only an Ontario Land Surveyor." To do business under this Act we will have to serve a couple of years. Legally, we might go on, but in my opinion the Bill will be a snag for us to go over in order to discharge the duties we have performed in the past.

The President—I have an amendment to Mr. Aylesworth's motion: Moved by Mr. Sewell, seconded by Mr. H. H. Gibson, that the Engineer's Bill for incorporation be opposed by this Association unless a clause be inserted admitting all members of this Association at the time of the passing of the Bill to full membership without fees, or to the privileges of practising civil engineering.

Mr. Aylesworth—We ought to be willing to adopt reciprocal relations with the Engineers, and to admit all the Engineers without fees into our Association. It appears to me that if a person wishes to join an Association he ought to be willing to pay the fees necessary to run that institution.

The President—Would you be willing to admit members of the Civil Engineers into the Land Surveyors' Association?

Mr. G. L. Brown—It is their request that they be allowed to pursue our usual business, and that we should not interfere in order that they may receive the advantages. We can do all the engineering we like. We do not want to go before the Legislature to ask any benefits. If they get such a Bill as that of 1899 passed by the Legislature, it will be really an injury to us, and will take money out of our pockets. If I could get the backing of the members of the Association, I would approve of our opposing the matter entirely. When it came before the last session of the Legislature, I did send letters to different members of the House asking them to vote against it, and I received replies from some of them stating that they would take it into their serious consideration.

Mr. Jones—Mr. Chairman, as we are situated at present, anybody can call himself a Civil Engineer and encroach upon our rights as Ontario Land Surveyors, as I have found in my own experience.

In the part of the country that I come from, we have very little to do except drainage. As the present municipal law is, any man who may call himself a Civil Engineer may be appointed to carry on important drainage works, and in that way shut out members of our Association who are more particularly qualified to do that kind of work.

Mr. George Ross (Welland)—Mr. President, I think this proposed Act encroaches upon the rights of Land Surveyors. I do not think it would improve the standing of Land Surveyors if this Act went through into law. Land Surveyors now have to act as Engineers on various kinds of municipal work, bridges, highway bridges and drainage work; and in fact, they have to take up almost everything to make a living, and the Board of Examiners now examine the candidates on various branches of engineering, and, as far as I am concerned, I do not think it would be advisable for the Surveyors to back either the present Bill or the Bill of 1899.

Mr. Lewis Bolton—I think, Mr. President, we might compromise the matter, so as to reach a working basis with the new society.

The President—They are not asking to take away work from Ontario Land Surveyors, and are only asking us to join them.

Mr. George Ross—I do not think it is a hardship at all that anybody who wishes to belong to a certain society should be required to pay the fees prescribed. Any Surveyor may become a member of the Canadian Society, according to the present Bill, upon paying the prescribed fee for the year. We should not ask to be allowed to become members of the society without paying the fees. I certainly would vote against the amendment on that ground.

Mr. George Smith—Mr. President, the mere question of payment of fees is a small matter that none of us really care very much about. If we want to join the Engineers' Society the question of the payment of fees is not worthy of consideration.

Mr. DeQ. Sewell—We do not want to join them. We want all the privileges of practising as at present.

Mr. George Smith—The point I have before my mind's eye is this: Civil Engineers, or some of them, have a habit of talking about Ontario Land Surveyors as though we could do nothing beyond running farm boundary lines. As far as I see, by the

training of the profession to-day, I think we are competent to undertake almost any ordinary engineering work that comes in our way, and in fact we have to do it. If this society is incorporated, as the Bill reads, I think we Ontario Land Surveyors will not be able to do anything; they will be licensed, and we only fit to run farm boundary lines!

The President—I know most of the Civil Engineers that I have spoken to look upon the work of Ontario Land Surveyors as being only a branch of Civil Engineering. We look upon it very much the other way.

Mr. George Smith—And we ought to support our views.

The President then read the motion by Mr. Aylesworth, and the amendment thereto moved by Mr Sewell, and said: If there is no further discussion, I will put the amendment. I see Mr. Willis Chipman has just come in, and we would be glad to hear anything he may have to say as to the subject of this debate.

Mr. Chipman—According to the Bill of 1899, as I understood it, the members of the Association would become members of the Civil Engineers' Society upon payment of the fees. Full membership means either Member or Associate Member.

The President then called for the vote on the amendment, and declared the amendment lost; after which he called for the votes in favor of and against the original motion, and declared the motion carried.

DRAINAGE ACT.

BY MR. M. GAVILLER.

On some of those questions there is room for discussion, and it might be well to take the questions up separately, in order to give an opportunity for discussion. I will begin and read the questions over separately, so that they may be taken up one at a time.

"What is the qualification of the Engineer required by the Act?" Answer—To be a human being.

Mr. Aylesworth—What other answer could be given? Does Mr. Gaviller wish to imply that the Engineer should be an Ontario Land Surveyor? I do not think this Association need find fault with the present qualification. The Township Councils are there for the benefit of the people, elected directly by the people, and are supposed to look after the interests of the people whom they represent, and I suppose a good many of them do. It is not always convenient for them to obtain the services of an Ontario Land Surveyor from, perhaps, some distance away; and perhaps it may be a minor dispute that some intelligent human being, without being an Ontario Land Surveyor, could adjust amicably. I do not think that this Association need find any fault with the Engineer.

As far as I am concerned, I think most of the townships appoint an Ontario Land Surveyor where they do not have to go too far to obtain one, and if the man is valuable they generally treat him all right.

Mr. H. DeQ. Sewell—I think the whole thing resolves itself into a continuation of the discussion of the Engineers' Bill. It seems to me that is the root of the whole evil. This Act has been got up for the purpose of suiting everybody, whereas, properly speaking, it ought to be confined to our profession. We ought to have that law amended so as to insist that somebody qualified to do the work should do it.

Mr. A. J. Van Nostrand—Mr. President, I do not want to open up the old question of the incorporation of the Civil Engineers, but it seems to me that if there were some incorpora-

tion or some way in which a man could be designated, although he was not necessarily an O.L.S., it would be to the advantage of both.

Not long ago I had a conversation with a surveyor practising drainage work in a district where I know the rates for surveying are eight and ten dollars a day, and he said he charged five dollars a day for drainage work. I asked him why he did not charge the usual rate, and he said if he charged more the councils would not pay it, but would get someone who had no qualifications in particular and would struggle along in that way.

If there were some means of fixing a standard to which Engineers for these purposes would be brought up, I think it would be of advantage.

I had a case in my own experience lately; I was brought in contact with the Township Engineer for an adjoining township under the Ditches and Watercourses Act. He was paid $2 a day, and was quite tickled to get it. I was charging $6 a day and had no trouble in collecting it. After I had finished the work in which we were jointly engaged, he wrote to me to know if I could tell him of any place where he could get one of those machines which you take levels with, as he would like to get one, because he thought they were quite handy things to have in his position.

Mr. Brown—Mr. Van Nostrand's experience puts me in mind of a man in our part of the country, a Township Engineer; he had what they called a level, and it got out of adjustment, and the council instructed him to bring it to me. After very carefully explaining the method of adjusting it, he said to me, "You know, when I go out to look at a ditch, if I don't have something to look through, they do not think I am doing anything.

Mr. Aylesworth—Having listened to the whole of the paper, I think we might let it all pass until we come to the bottom of the second page, where it makes reference to section 28 of, I presume, the Ditches and Watercourses Act, under which, as amended, the Engineer cannot order any work to be done after six months.

I think that amendment practically kills the Act. I am Engineer for I do not know how many municipalities, in three different counties, and I find that amendment to be a stumbling-

block and obstruction. I think it never should have been put in. I do not see why an Engnieer should not go on and order a work within two years, or until the work was done. I think this Association, as many of the members of it are doing work under the Ditches and Watercourses Act, ought to apply to have the Act amended by expunging or diluting that amendment.

Mr. Brown—I am led to believe that at the last session of the Legislature a change was made. I have not seen it, but I saw a letter written by the leader of the Opposition, in which he stated that the Act had been changed in this respect to make it compulsory for the Engineer to go on at the expiration of the time limit.

Mr. Aylesworth—I think the legislation this year was in regard to the Municipal Drainage Act, and not in regard to the Ditches and Watercourses Act.

Mr. George Smith—From our present knowledge, the Engineer cannot move until he gets this written notice. No one will send the notice, because they are afraid of the expense. The result is, that no one has done the work except perhaps a little bit here and another little bit there. Then the six months elapses and nothing has been done, and the only way to do it is to begin the whole thing over again. I agree that the six months' limit should be expunged.

Mr. H. H. Gibson—I had a case like this; at the expiration of the time limit the party sent word to me, on the very last day. I went over the drain and inspected it, and as I went along I assessed each man for my costs so much money, according to the amount of work he had to do yet, and I went away with the money in my pocket, and I gave them another six months to do the work in. The work has been done since.

Mr. Jones—I think the six months in connection with the Ditches and Watercourses Act had a bad effect upon it. There may have been some reason why such an amendment was passed. Heretofore in an award, perhaps nobody would complain, and it would be several years before the ditch would be completed, or perhaps it would not be completed at all. Perhaps somebody would do a little work, and then the Engineer would be called upon to complete the work. I think it is better to have the work completed within, say, a year or eighteen months.

I think the amendment all right, only the limit is a little too narrow, as six months is not long enough.

Mr. Aylesworth—Why should it not be allowed to run the two years during which the award runs?

Mr. Jones—The Engineer can advise the party who sends in the requisition that he should see that the work is all completed within the six months set for the completion thereof, and that if it is not completed within the six months he should notify the Engineer, and then the Engineer should let the work.

Mr H. H. Gibson—It is no expense to the party who does it.

Mr. Jones—No; then the work can be re-let different times, as long as it is let within the six months. I think the amendment was in the right line, only the time was made a little too short. However, one can give a little longer time, in some cases. Supposing a ditch is laid out a little late in the fall, they can give until next summer, and then if it is was not finshed that fall, it should be let before the winter sets in.

If nobody has sufficient interest in the ditch to notify the Engineer, I do not suppose the ditch can be required by anyone very urgently.

Mr George Smith—The only way to get over the difficulty, in my practice, is to see the promoter of the scheme, and say to him that if he allows the six months to expire before the drain is completed, he will have no drain, and the whole of the work will have to be done over again. It might work better if the six months limit was extended to a year.

I think it would be much better if the law required the Engineer to inspect the work before the expiry of the time limit and to enforce the award; then he would not need to wait for this slow coming notice, without which, at present, he cannot move.

Mr. Brown—I think it ought also to be necessary to file with the Clerk of the Township a certificate that the ditch is complete, otherwise the section with reference to reconsideration of the award is not workable.

Mr. C. A. Jones—I think it would be better that it should be extended to two years. For my part, I do not know why it was ever amended. I never complained or heard any complaint about it as it stood in the original.

Mr. George Ross—It must have been slipped in by some

person for some particular purpose. Somebody may have had a reason for putting it there. There are Ditch Inspectors under certain clauses of the Municipal Act.

The President—How would it be to have an inspector appointed to superintend them all? That has been suggested by one or two Surveyors to me. I have not formed an opinion on it myself.

Mr. George Ross—I think it would be better to extend the time limit of six months to one or two years and make it compulsory for the Engineer to inspect upon the expiry of the time set by the award. In case a ditch was not completed within six months, and the work not having been all done, could anyone ask for another award to be made on that ditch right away after the six months?

Mr. W. R. Aylsworth—No.

Mr. Smith—They cannot do it at all, unless by consent. A thing does not exist until the certificate of the completion of the work is filed, and then it has one or two years to run, according to whether it is a covered or an open drain; after that any interested party may apply for the reconsideration of the award. When a drain has been on trial for a year, there should be a manifest improvement. The amendment is a menace to the whole working of the Act.

Mr. C. A. Jones—I think you could start it as a new drain, not as a reconsideration, for you could not reconsider a thing which was not in existence.

Mr. George Smith—You would have to word your petition very carefully.

I think we are interested in getting some amendment to that section, either extending the time, or else getting it made compulsory upon the Engineer to inspect within a certain time after the completion of the work—say a month. If the Act was amended in the way last mentioned, if the Engineer did not get his requisition or notice in writing to inspect within six months after the completion of the work, then it would become his duty to inspect. The work is not completed until the Engineer's certificate is filed.

Mr. Brown—Mr. Chairman, it seems to me that there is an objection to extending the time, becaue if some of the parties in good faith go on and perform their portion of the work, but the Engineer is not called upon within a short time to inspect,

when the Engineer does come round at the end of the year, that man's portion has been filled in with sediment, because of the non-completion of another portion of the work.

Mr. George Ross—When a man has completed his work, he can call on the Engineer at any time, and the Engineer must go.

Mr. Brown—If the man who is so much interested does not call for the Engineer, there is no likelihood that another man will do so.

Mr. George Smtih—That is the difficulty. On one drain which I had under the Ditches and Watercourses Act, one man did his work and finished it up, but I did not get notice to inspect it, so I did not go near it. Another man started to do his work and plowed and scraped partly, but the rains came on, and the plowed ground went down on to the man who had properly done his work. This latter man did not like to issue the notice, because there had been enough ill feeling over the job.

Nobody likes to issue that notice. There is generally some ill feeling over the award, and when a man has done his work under it he is inclined to rest content and say, "Let somebody else call upon the Engineer, and when he comes along he will find my share of the work done, any way." Then the portion that is done gets filled in from the portion that is only partly done, or not done at all, and the whole scheme goes to the wall. That six months goes by very rapidly, especially if the winter is taken out of it, more especially when nobody thinks of the drain until the water is on again.

Mr. George Ross—And there are other excuses advanced sometimes for the non-completion of a ditch. Attempts are made to hinder a ditch from being completed. I know of one instance where a party threatened to have anyone arrested who attempted to make a drain, under the award, on his land. He claimed that he had got advice from a lawyer who was a member of the Dominion House of Commons, that he could arrest anyone who attempted to do the work on a charge of trespass, under the Criminal Code. That man scared out the other parties from going on with that portion of the ditch on his land, and I was called upon to let the work, and had a good deal of difficulty in getting anybody to bid it in, because the man came there and threatened to have anybody arrested and locked up who attempted to go on his place.

Of course it is easy enough to get excuses for not going on, and to scare out a neighbor. If a neighbor is afraid to go on and have a ditch completed, I suppose he deserves to have his land under water. In the case I have in mind, a man sent me the notice, but he did not come and bid in the work.

Mr. Jones—I think there would be a difficulty about having each party to an award having his own portion of the drain inspected when it was completed, from the fact that sometimes those portions are very small, and the cost of inspecting that in some cases would amount to more than the cost of the work that had been done if we had to inspect each portion separately.

Mr. Aylsworth—Why should we not inspect the whole work at one time? Generally the same time is fixed for all the work.

I would be in favor of referring this matter to the Legislative Committee of this body, and asking to have section 1 of clause 35 repealed, and to make it the duty of the Engineer at the expiration of the time, to go and inspect the ditch, and if it was not done, to let the work to be done. He could then let every portion that was incomplete.

Mr. C. A. Jones—Supposing the man above could not complete his work until the man below got his portion done, then it would be hardly fair.

Mr. W. R. Aylesworth—I think thirty days would be a sufficient limit for that.

Mr. Gorge Ross—The Act makes provision for cases where the Engineer is satisfied as to the good faith of any party to the award. He cannot draw too many fine distinctions, but has to give a kind of rough justice. It is pretty hard to cover every case unless you leave some to discretion.

Mr. C. A. Jones—In my experience I have found that portion of the Act to work very well until this six months clause came in.

Mr. G. L. Brown—It seems to me that if the parties to the award were sure that the Engineer was going to be called in at the expiration of the time limit, they would take good care to have their portion of the work completed, because if not, the costs follow. I think such a provision would have a good effect.

Mr. George Smith—It is moved by myself, and seconded

by Mr. W. R. Aylsworth, that in the opinion of this Association, section 28 of the Ditches and Watercourses Act should be amended so that it would be the duty of the Engineer to inspect the work done under any award made under the Act within thirty days from the time for the completion thereof, without notice, and if the work is found complete, that he should file his certificate thereof with the Clerk, and if not completed, then he should enforce the award in the usual manner.

The thirty days would be allowed for inspection; if the time ran out in the fall, he could inspect it within the thirty days and then he could carry out the work within a proper time.

Mr. C. A. Jones—Would not the thirty days clause make it unworkable at certain seasons of the year?

Mr. W. R. Aylsworth—If he has made the completion of the work to come about the end of September, he could inspect the work in October or November. It is his own fault if an Engineer fixes the date for completion at a time so late on in the fall season that he cannot inspect it.

Mr. George Smith—One man makes an award, and a council takes advantage of the provision of the law which provides that they may dismiss an Engineer at any time; then a second man has to enforce the award made by the first man, and he may have difficulties in the work which he would not have had if he had been in charge from the first.

I think the rule in the profession is to limit the time for the completion of any drainage work by a time not unreasonably late in the fall; it is usually sometime in October, and I never saw an award yet where the time was limited to come in, say, in the winter time. As Mr. Aylsworth says, there should be time enough given to see whether the work was done or not. If the Engineer made the inspection and found that the work was not done, he could say, "It is too late to let the work this fall, I will let it to be done at a proper time. I think that this amendment should leave it in the hands of the Engineer.

There is sometimes considerable trouble over work of that kind. An award is appealed against, and a certain time is occupied in hearing the appeal; then the judge may amend the award, and extend the time for the work. Very often the time is fixed by the judge. The season for doing such work is so short, and

the time for litigation is so long, that it is often impossible to get a drain constructed within the same year, unless the work is very small. If the Engineer inspected a drain in the fall, he could issue his certificate and free those who had done their work.

Mr. Aylsworth—Supposing we say, instead of merely section 28, that the Ditches and Watercourses Act be amended, because there are other portions of the Act which need amendment at the same time.

Mr. Villiers Sankey—It will be necessary for us to consider what will be the best method of getting this resolution, which has just been made, before the Legislature at the next session, whether some of the Surveyors who are more intimately acquainted with this class of work than I am could see about it. I suppose it will have to be brought before the House in the shape of an amendment by some member of the House.

Mr. Aylsworth—I think it will be necessary for the Legislative Committee to draft a bill making the necessary changes in the present law, because no man not practically acquainted with the work could properly prepare it. If such a Committee of our Association were to prepare it, some member of the House would get it printed, or probably the Government would see to that.

Mr. Sankey—If the drainage men would get together, probably by correspondence, and get the amendments put into proper form, so as to be workable, then the Association could present it to the Government, and could say that the amendments were outlined by men who knew what they were talking about.

Mr. Smith—I was thinking of it being referred to the Legislative Committee. The Association controls that Committee.

The President then put the motion, and, after calling for the votes, declared the motion carried.

Mr. Sankey—Then, Mr. President, I move, seconded by Mr. H. H. Gibson, that Messrs. Smith, Aylsworth and Jones be appointed a Committee to draft the proposed amendment of the Ditches and Watercourses Act, as referred to in the last resolution.

The President—If there is no discussion upon this motion, I shall put it to a vote.

The President having called for the votes, declared the motion carried.

Mr. C. A. Jones—Are there any other questions on the paper of Mr. Gaviller that any of the members would like to discuss?

The President—It would be as well if you would read the points remaining.

Mr. Jones—"Who gives bonds for the proper carrying out of the work?" Answer—Nobody.

Mr. H. H. Gibson—I think the best bond is to have it stated in the agreement that is made with the contractor that he will be paid no money until he has done work beyond say $200, or some stated amount which will be substantial, that that amount of money will always be held back until the final completion of the work. I had a case lately where the agreement called for the contractor to be paid at the rate of eighty per cent. on the completed work. When he got to a certain point, he stopped work and asked that a certificate be given him. I had to give it, and as soon as he got it he picked up his traps and returned to Toronto, and never went near the job again. If I had had an agreement that he should do more than $200 of work before he got any money, and that $200 should be held back until the completion of the work, I would have had that work completed properly. That was work under the Drainage Act. I had nothing to do with the letting of the work, and knew nothing about the advertising.

Mr. H. W. Selby—The members of the council ought to be the parties chiefly interested, and they ought to be sufficiently interested to see that the contracts are let to proper parties. I do not think it is our duty as members of this Association to say what the councils ought or ought not to do. I do not know that we would be justified in taking too much upon ourselves in that direction. The council often appoint a Committee of one or two of themselves, and sometimes adding the Engineer. The council are directly responsible to the people for the work, and I do not know that we should interfere with that too much.

Mr. C. E. Jones—"Who superintends the work?" Answer—The Drainage Committee.

The President—And that often puts the Engineer at a great disadvantage. He may make an accurate survey and make out

accurate reports, and the Drainage Committee, the members of which know nothing at all about the matter, interfere with what he has done and superintend the work and spoil it altogether. I think the whole thing should be left in the hands of the Engineer. If he is not capable of superintending the whole thing, he is not capable of doing anything.

Mr. W. H. Selby—If the Engineer is not called upon and the work is not done properly, there is then another job for the Engineer, so why should he complain?

Mr. H. H.Gibson—In the council with which I am connected, when the contract is let the work is handed over to me and I am held responsible for the work.

Mr. Aylsworth—I agree with the President and Mr. Gibson, that that is the proper way, but under the Municipal Drainage Act the burden of the business is put upon the municipal councils, and they employ anybody whom they choose, and they can use him as they choose. It is a very different thing from the Ditches and Watercourses Act, where they appoint a man and hold him responsible for the whole of the business. I would suggest that that clause pass, and that we should not interfere with the duties and responsibilties of the members of the municipal councils.

Mr. C. A. Jones—"What is outlet assessment?"—that is probably a question which might be discussed with advantage. The answer Mr. Gaviller gives is "Nobody knows."

Mr. H. W. Selby—I would ask Mr. Jones to give us an idea of what "outlet assessment" means. I think the term was put in at the request of parties in Essex, or the western part of the Province, where large drainage works are carried out. Those of us who live in other parts of the Province, engaged in smaller works, hardly understand the true meaning of these terms. It was put in the statute for certain purposes known by certain parties, but the judges do not seem to understand it; certainly they interpret it differently. I would like to ask Mr. Jones, who is from that district, to give us a few pointers.

Mr. C. A. Jones—For my part, I find it a pretty difficult question to define.

I have sometimes thought I understood Outlet Assessment or Outlet Liability pretty well, until some case would come up before the court and the judge would give a different interpre-

tation, or the counsel on either side would give a different interpretation and make me believe I was wrong and that I did not know anything about it. Then probably in the very next case there would be still a different interpretation taken of "outlet liability."

Mr. Aylesworth—Then you agree with that answer?

Mr. Jones—I agree with it in a measure. My understanding of "outlet liability," is where it gives a better outlet for a drain either then in existence or under contemplation, or that the owners may desire to construct in the future. If this drainage work being constructed will give a better outlet for a drain which has already been built and is in existence, or which is contemplated, but that the actual benefit of draining the land or lowering the water on their land is not carried out by this work under contemplation, but that it will give an outlet for some further drainage work when it may be constructed, so as to let the water away from the owners' land more freely than before the drainage work under contemplation has been constructed.

Mr. H. W. Selby—With regard to high lands, that do not need any drainage, but pour their waters down into the lower lands which do require drainage, what would you call that?

Mr. C. A. Jones—I would call that injuring liability.

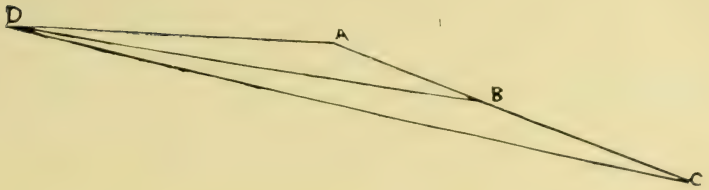
Mr. H. W. Selby—Another section of the Act would seem to indicate that anybody throwing water faster than nature would take it would be liable—what would you call that?

Mr. C. A. Jones— There is a clause in the Act that would lead one to believe that all liability might be outlet liability, where the water from any lands passes through another drain, whether they need it or not for the outlet, or whether it is liability that they would be assessable for outlet, or that would be called outlet liability, according to the section of the Act.

Mr. H. DeQ. Sewell—I presume it is to pay for the security of the outlet.

Mr. C. A. Jones—Yes; they may be benefited by the drain; it may require a larger drain to accommodate the water from the man above, and may make him a better outlet by constructing a drain below.

Mr .Gibson—I have made a sketch on the blackboard to illustrate a point which I would like to make.



The man owning the land from D to A could drain his land at this point, if the drain were dug to the grade shown here; but when the drain is extended further, the slope is cut down, so that he has a better outlet by this extension to D. In the same way, when the drain is extended to C, the fall is still better.

Would not this furnish an answer to that question? The difference of cost between digging the drain from D to A, or from D to B, would be the extra cost required to dig the drain to give D-A a better drainage at the lower outlet.

Mr. H. W. Selby—Supposing the man's lands at D were high, so that he did not need any drain, what would that be?

Mr. C. A. Jones—I think that would be injuring liability, not outlet liability.

Mr. H. W. Selby—The water from his place runs into the road drain and so runs away.

Mr. H. H. Gibson—I would think that was injuring liability.

Mr. G. L. Brown—I had an instance of that where several pieces of property drained into the road ditches, and the road ditches contributed their water to the drainage system, and it was held that those lands which sent that water down were not assessable under any condition at all, because they were high lands, although they used the drains in that way.

Mr. H. W. Selby—The Drainage Act reads as if any man using a ditch or pouring his water down into a ditch should be assessed, and I think probably that is correct, too, because a larger ditch is then required.

Mr. Brown—That was the principle upon which I proceeded in making an assesment of those high lands in the case I have mentioned; but the learned judge held that I was wrong.

Mr. H. W. Selby—If they had drains or trenches from the furrows to the road ditch, they would have been liable.

Mr. C. A. Jones—I have heard judges hold that in the ordinary tillage of the land there are what they call riparian rights, which are not assessable. It is only where artificial work is done with the intention of speeding the water that they can be assessed.

Mr. G. L. Brown—How does Mr. Jones arrive at the assessment for outlet liability?

Mr. C. A. Jones—There is no hard and fast rule for arriving at that, because all the assessment is by comparison. For instance, a drain may be, say, one thousand dollars of benefit to certain parties interested, but the drain will only cost five hundred dollars. You could not then assess them the full amount of the benefit that it would be to that land, because that would amount to more than the cost of the drain. In the same way with regard to outlet and injuring liability.

But where the difficulty comes in is in comparing the benefit assessment, the outlet assessment and the injury liability assessment together.

You can compare the benefit assessment fairly well, by putting it at so much per acre, whether it is twice that amount of value per acre or not. The trouble is that it might be worth $1 per acre to one as benefit, but it is a hard matter to compare that with the benefit to another man for outlet; and then it is still harder, probably, to say what another man should pay for injuring liability who is further up and does not need it for an outlet, but uses it as such because he must have some place for the water to go away. It is comparing the three different assessments and getting a fair and equal basis between the three.

Mr. G. L. Brown—Who is responsible for putting that section in the Act which says that the Engineer in making his assessment for outlet liability and injuring liability shall base his assessment upon the speed and volume, etc.?

Mr. C. A. Jones—I do not know how that came in, but that would make an almost endless task.

Mr. H. H. Gibson—The plan which I have sketched upon the blackboard illustrates that. It makes no difference whether

you have a sufficient outlet now or not, if you get a better outlet you have to pay for it.

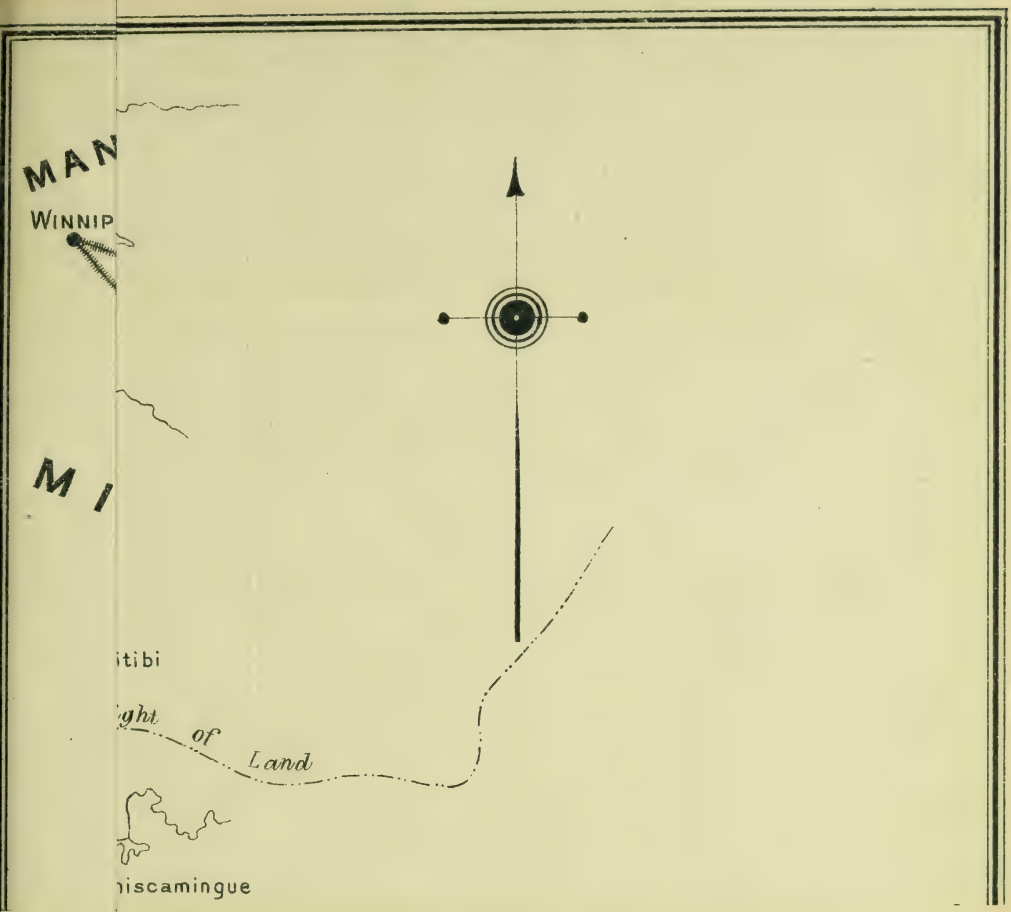
Mr. C. A. Jones—You can fix a rule which will answer in one case, and then the very next drain you go upon you find that that rule will not do.

Mr. H. H. Gibson—You have to be awfully wise in each case.

Mr. C. A. Jones—And when you go to the court you find that the Engineer is expected to be more fully informed as to the rises and all the other peculiarities of the ground on every rod of the country about in that area than are the owners themselves. When you go into the witness box you will be asked questions about things which you would never have noticed if you had lived on the farm all your life.

Mr. G. L. Brown—You know that Engineers frequently know more about the land than the man who owns it does?

Mr. C. A. Jones—Yes; and find it very difficult, sometimes, to convince an owner as to the way in which the land naturally drains.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LAKE ERIE
Albany River
English River
Lac Seul
St Joseph L.
Boundary
Northern
Ogoke R.
Abitibi R.
Mattagami R.
Missinaibi R.
Moose R.
Moose Factory
Fort Albany
Winnipeg
Rat Portage
Lake of the Woods
Rainy River
Rainy River
Pigeon River
Port Arthur
Fort William
Nepigon
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Kenogami River
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Sudbury
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Mattawa
Parry Sound
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River St. Lawrence
Manitoulin Is
Georgian Bay
Midland
Orillia
Owen Sound
Collingwood
Barrie
Peterboro
Kingston
Brockville
Goderich
Toronto
Hamilton
St Catharines
Niagara
Buffalo
Sarnia
London
Windsor
Chicago
Lake of the Woods
Rainy River
Thunder Bay
Algoma
Nipissing
Temagami
Temiscamingue
Abitibi
Height of Land
O.L.S. Nivens 2nd Base Line
O.L.S. Speights Line
O.L.S. Niven's 1st Base Line
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Papers.

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EXPLORATIONS IN NORTHERN ONTARIO IN 1900.

BY GEO. B. KIRPKATRICK, DIRECTOR OF SURVEYS.

In December, 1899, the Honorable George W. Ross, Premier of the Province of Ontario, directed me to prepare a scheme of exploration in the northern parts of the districts of Nipissing, Algoma, Thunder Bay and Rainy River, as he was anxious to have this country explored as soon as possible, and desired to have an estimate of what such an exploration would cost, in order that he might submit it to the approaching Session of the Legislature.

In furtherance of this object, I availed myself of the courtesy of the Department of the Interior and the Geological Survey Department, Ottawa, in getting all the printed information at their disposal as regards this country. Many of the rivers had been traversed by the Geological Survey Department, and I obtained copies of the plans of said surveys, with the reports of the different geologists. With this information a map was prepared on a scale of four miles to an inch, showing what was known of this territory, and it appears from all the information obtained that a great deal of this territory was practically a terra incognita.

I prepared a scheme for the exploration of this territory, extending as it did from the Interprovincial Boundary between the Provinces of Ontario and Quebec on the east, and the boundary between the Provinces of Ontario and Manitoba on the west. Forty thousand dollars was the estimate of the probable cost, and this amount was voted by the Legislature subsequently.

My idea was to combine permanent astronomical lines marked by permanent monuments where possible, with the more preliminary explorations, in order to obtain a base for future operations. The most feasible way of accomplishing this was to run a base line about seventy-two miles in length due east astronomically from about the 198th mile on Niven's boundary, between the Districts of Algoma and Nipissing over to the inter-provincial boundary, or as near thereto as possible (this boundary not having been run except as far north as Lake Abitibi, forty-five miles north of the head of Lake Temiscamingue), and to run another line due west astronomically from the same point about one hundred miles, to the Missanabie River.

I proposed that two exploring parties should be attached to each of these survey parties, one operating on one side and the other on the other side of the lines so run, exploring a territory of about one hundred miles square each.

I also laid down the work for nine other parties. I suggested that a geological party be sent to examine the coal deposits on the River Metagami, which are known to exist about eighty miles apart, that is, to exist at points which are eighty miles apart on the river, and I recommended that boring tools be taken along with the party, and that the extent of the deposit and the depth thereof be ascertained. All my recommendations except this one were adopted by the Premier. On the advice of the Director of the Bureau of Mines, Mr. Blue, this last-mentioned recommendation was not included in the subsequent instructions.

I recommended that an Ontario Land Surveyor be placed at the head of each party, and that a geologist should be attached also to each party, and that experienced bushmen or good judges of timber should accompany each party so as to give an estimate of the timber found.

I suggested that the start should be made in the month of June, so as to avoid any possible chance of the parties being frozen in before their return.

I impressed the fact that great care would have to be taken in the selection of the heads of the parties, as much would depend upon their judgment for the safety and welfare of those under their charge.

I also pointed out what the information sought would be. *(a)* The nature of the soil. *(b)* The nature, extent, size and

quality of the timber. *(c)* The fixed rocks met with, and economic minerals (if any). *(d)* The general features of the country procured from a track survey of the water communications, etc. *(e)* Any valuable water powers, giving the estimated fall and describing the nature of the banks on either side.

This memorandum was approved by the Honorable Premier and the Commissioner of Crown Lands, and the money having been voted by the Legislature, amounting to $40,000, preparation was made for the instructions, and for the gaining of all the information possible for the benefit of those who were going to make the explorations.

A scheme for the exploration of the unsurveyed lands in this territory was prepared and approved of by the Honorable Commissioner of Crown Lands, in which, generally, the duties of the surveyor in charge, the duties of the land and timber estimator, and the duties of the geologist, were set out. This was published in pamphlet form for the use of the different parties.

The districts to be explored were set out in this pamphlet, giving the general description of each party's field of operations.

No. 1.—A base line due east from the 198th mile of the Algoma-Nipissing line across the District of Nipissing to the boundary between Ontario and Quebec, a distance of seventy-two miles or thereabouts. To be explored fifty miles on each side of the base line.

No 2.—A base line due west from the 198th mile of the Algoma-Nipissing line into the District of Algoma, to the Missanabie River, a distance of about 100 miles. To be explored fifty miles on each side of the base line.

No. 3.—From Lake Temagami northward, to Montreal River, and upon the east and west sides of the Algoma-Nipissing line.

No. 4.—The Kabinakagami River, twenty to twenty-five miles upon both sides, going in from Grasett Station, on the Canadian Pacific Railway; also a section of the Missanabie River, above its junction with the Moose River, not included in the area of No. 2, and twenty miles on the west side of the Moose, below the mouth of the Missanabie.

No. 5.—From Jackfish Station, on Lake Superior, to Long Lake; thence down Kenogami River, the outlet of Long Lake, to Albany River; thence down the Albany to Hudson's Bay. English River to be explored for twenty miles on each side, and

Albany River, by way of any large streams flowing into it from the south.

No. 6.—From Ombabika Bay, at the north-east of Lake Nepigon, by Ombabika River and canoe routes to Albany River, and down the Albany to the mouth of the Kenogami. Ombabika River and canoe routes to be explored twenty miles on each side, and the Albany by streams flowing into it from the south.

No. 7.—From Wabinosh Bay, at the northwest of Lake Nepigon, up Wabinosh River, and across the height of land to Albany River, and sections of the Albany and Savant Rivers.

No. 8.—West of Lake Nepigon and Nepigon River, to Dog Lake, up Gull River from Lake Nepigon, to the north of Dog Lake, and the country around Black Sturgeon Lake.

No. 9.—From Dinorwic, on the Canadian Pacific Railway, north to Lake Minnietakie, Lac Seul and Lake St. Joseph, and along the Root and English Rivers and Sturgeon Lake.

No. 10.—From the Canadian Pacific Railway between Wabigoon and the western boundary of the Province, north to Lac Seul and English River.

The instructions to the different parties were dated in June, 1900, and the parties lost no time in getting to work as soon thereafter as practicable.

Very detailed instructions were given to each of the surveyors in charge of the parties, in addition to the general instructions. These instructions, of course, varied according to the nature of the country to be explored, and the head of each party was furnished with copies of all the geologcial surveys known, and also copies of the reports of the different officers of the Geological Survey Department who had made surveys in these districts, in order that the surveyor might avail himself of all known information, and thus save duplicating work when time was all-important, as it was desirable to secure as much additional information as was possible within the time allowed for the different surveys. It is unnecessary to give these instructions in detail here, as one of them has already been printed in the Report of the Explorations in Northern Ontario in 1900. The others were similar in most respects.

The parties were equipped in every case with everything that could be thought of to insure the desired results, and before the snow came in the winter of 1900 all the exploration parties had returned without mishap.

As soon as possible after their return, their reports were prepared for laying before the Legislature, and I am glad to say the result of these extensive explorations, as detailed in the elaborate reports sent in by the surveyor in charge of the party, the land and timber estimator and the geologist, has fully justified the most sanguine expectations in regard to the natural wealth and fertility of Northern Ontario, and demonstrated the wisdom of the action taken. The total cost has been $40,518.28, a very close approximation to the original vote of the Legislature.

A great clay belt, running from the Quebec boundary west through the District of Nipissing and the District of Algoma, and into the District of Thunder Bay, comprising an area of at least 24,500 square miles, or nearly 16,000,000 acres, has been proven to exist, nearly all of which is well adapted for cultivation. This almost unbroken stretch of good farming land is equal in size to the twenty-three western counties of Old Ontario, or the districts lying west of a line drawn from Toronto to Midland. It covers an area as large as the States of Massachusetts, Connecticut, Rhode Island, New Jersey and Delaware combined, and is one half the size of the State of New York. It is remarkably well watered by numerous rivers, which, when the natural obstacles have been overcome, will afford a ready means of communication. The principal rivers are the Moose River, flowing into the James Bay, and its tributaries, the Abitibi, Metagami and Missanabie, and the Albany River, with its tributaries, the Genogami and Ogoke. The southern boundary of this great tract of fertile land is less than forty miles from Missanabie Station, on the Canadian Pacific Railway, and lies north of the height of land, being one immense level plateau sloping towards James Bay, and is an ideal one for the construction of railways and waggon roads.

In addition to the wealth of agricultural land discovered, were the extensive forests of spruce, jackpine and poplar. In the district of Nipissing, north of the Canadian Pacific Railway, there is estimated to be at least 20,000,000 cords of pulpwood; in the District of Thunder Bay 150,000,000 cords; in the District of Algoma, 100,000,000 cords; in the District of Rainy River, 18,000,000 cords; a grand total of 288,000,000 cords. Red and white pine of fine quality was explored in the Nipissing District and estimated to contain about three billions of feet B.M.

The climate, which is a necessary accompaniment of any lasting colonization, has been found to present no obstacles to successful settlement. The information obtained completely dispels the erroneous impression that its winters are of Arctic severity and its summers too short to enable crops to mature. The surveyors were almost unanimous in reporting the absence of summer frosts, and the vegetables found at the Hudson's Bay Company's posts were a living evidence of the possibility of successful agriculture. Even at Albany Post, on James Bay, the potato tops were green on the 25th of September. On October 3rd the garden produce had not yet been removed for the winter, tomatoes, cucumbers and all other vegetables being grown there. Only two nights of frost were observed up to the 28th of October.

I have mentioned a large area of agricultural clay land in one block. Let us see what this means when surveyed into townships and lots. At the usual size of townships, six miles square, there will be seven hundred townships. Allowing one hundred and sixty acres to each head of a family, and allowing five to each family, there would be in these seven hundred townships half a million of people; and taking into consideration villages and towns, which will necessarily spring up as the country is settled, I think a very small estimate would be that it would be able to maintain a population of at least one million souls.

The estimate of the pulpwood in this territory I have given from the reports as two hundred and eighty-eight millions of cords. Taking this quantity at the present rate of dues, 40 cents per cord, it is worth $115,200,000.

I have mentioned also three billion feet of white pine. Taking this at the present rate of bonus and dues, it is worth to the Province from fifteen to eighteen millions of dollars.

I have shown also that there are valuable water powers in this territory.

The Government has granted concessions for pulpwood to different pulp companies, reserving the right to increase the dues at any time. The agreements between these companies and the Government show that of the six companies to whom concessions have been granted, the capital agreed to be invested amounts to $4,350,000. This pulpwood industry will give employment to several thousands of men in this Prov-

ince, as the law provides that all pulpwood cut on Crown Lands must be manufactured in Canada.

I have said nothing of the mining resources of this territory, but in some parts very promising indications were found, leading to the belief that further development work will be successful. Mining has been carried on in portions of Northern Ontario already.

The mining law of the Province is to be found in the Mines Act, Chapter 36, Revised Statutes of Ontario, 1897. Under the provisions of this Act there has been received for mining lands sold and leased in 1900, $59,727, and in 1901, $46,730.

An exhibition of Ontario minerals was made by the Bureau of Mines at the Pan-American Exposition held at Buffalo, in 1901. Twenty-one awards were made to the Ontario exhibit, viz., 3 gold medals, 7 silver medals, 6 bronze medals, and 5 "honorable mentions," a larger number than the exhibit of any other State or country save Mexico. This speaks well for the future of the mining industry of this Province.

There are six new railways projected into Northern Ontario, aiming for James Bay, and applications have been received from representative steamship companies in London, England, who propose to establish a line of steamships between that city and James Bay.

From the above statement it will be seen that Northern Ontario is no mean heritage; and to give you some idea of the wealth of the Province, which is sometimes called the "Banner" Province of the Dominion, I might give you a few figures to prove this point.

Estimated area of the Province	126,000,000 Acres
Estimated area of above surveyed up to last year	40,116,075 "
Leaving unsurveyed	85 883,925 Acres
Estimated area of the Province	126,000,000 Acres
Estimated area sold or disposed of up to the end of 1900	22,863,578 "
Leaving undisposed of	103,136,422 Acres
Of which there are surveyed	17,252,497 "
Leaving unsurveyed	85,883,925 Acres

I have mentioned the success of the Ontario exhibit of minerals at the Pan-American Exposition. Let me mention some

of the other successes of the Province at the same Exposition. Under the heads of cattle, sheep, swine, horses and poultry, Ontario won prizes to the amount of $5,979.65 as against the United States' $7,956.52, beating the United States in sheep and swine, and running them very close in horses and poultry. In addition to that, the only gold medal awarded for cheese was to Ontario, the same exactly in the case of honey. In butter Ontario came second. The Ontario Bureau of Forestry received a silver medal for forestry products.

I am indebted to the Bureau of Industries for the following interesting statement, showing the present condition of the agricultural development of the Province of Ontario.

Number of farms in Ontario	175,000
Value of farms in Ontario	$1,000,000,000
Net products for Ontario farms for 1900	$ 158,274,403

I should like to mention also the Forest Reserves which have been set apart by the Legislature during the last few years.

1. A Reserve in the Counties of Addington and Frontenac, comprising 80,000 acres.

2. A Reserve at Thunder Bay, Lake Superior, comprising 45,000 acres.

3. The Temagami Reserve, comprising the region round Lake Temagami, in the District of Nipissing, containing about 1,400,000 acres.

These are in addition to the Algonquin National Park, in the District of Nipissing, comprising 1,100,000 acres.

The length of my paper reminds me that I must close, but I trust that the above facts may be useful in drawing attention to the magnificent results already reached, and spur on our sons to still greater achievements in the future. Assured that, under the blessing of the Almighty, if we are true to our best interests, throwing our energies into developing our Province, with all classes and nationalities standing firmly together, we shall build up a country second to none in the world, the freest and the best, and let us hope, reaching out to that righteousness which we are told "exalteth a nation," the brightest star in the Dominion of Canada, a member of that Empire upon which it has been said the sun never sets, ruled over for so long by Victoria the Good, and now having for its Head, Our Sovereign, Edward the Seventh, by the Grace of God, of the United King-

dom of Great Britain and Ireland, and of the British Dominions beyond the seas, King, Defender of the Faith, Emperor of India, whom may God preserve.

I close my paper with an aspiration familiar to all—

"Lord God of Hosts, be with us yet,
Lest we forget — lest we forget."

—Rudyard Kipling.

DISCUSSION.

President Dickson—I have attended many meetings of the association and have heard many papers, but I have never heard a more interesting and instructive paper than this. Without attempting to flatter our friend Mr. Kirkpatrick, I think his paper is most instructive, dealing as it does with the resources of our country. The paper is not in any way an exaggeration or an exhibition of boastfulness, for it is all based on facts and figures, and I believe we can rely upon every word said by the gentlemen who were sent in to explore as being perfectly true and correct; we can rely upon their report as being very accurate, for they know of what they speak. There are some gentlemen with us to-night who are not surveyors, and I would like to hear from some of them.

Mr. Thomas Southworth (Director of Colonization and Forestry)—I am glad to be able to express my appreciation of the paper read by Mr. Kirkpatrick, and although a great deal of what has been said by him is very familiar to me, it has been put in such an interesting way that it sounds new. I do not think that the accuracy that has been referred to was over-estimated by your President's words. I happened to see the report of one of the surveying parties before it was printed, and the surveyor reporting was a little diffident about what he said—it is true it was about fish; he hesitated about putting on paper what he actually saw. I think, with Mr. Kirkpatrick, that the estimate of timber made by the exploring parties will be found to be very considerably under the actual amount. I think that has always been the case, that the estimate of timber has been very much below what is actually cut on the territory estimated. However, I doubt very much if we can figure on the possible revenue of fifty cents a cord from the total quantity of pulpwood, because the vast body, the great bulk of pulpwood, grows on land that is most suitable for agriculture, and if the plans of the Government are carried out, and

they will be to a very great extent. there will be very little revenue derived from pulpwood. Mr. Kirkpatrick did not mention that just south of the high land there occurs a small farm of about a million acres, similar to that sixteen million acres; and if the large belt is settled as rapidly as the small belt was settled, there will be very little revenue from the pulpwood, for as you all know, the settler has the privilege of taking off the pulpwood free from dues; and if it is settled as the other was, it will be settled in a very few years, particularly if the railways referred to by Mr. Kirkpatrick are extended as rapidly as I hope they will be; one of them, I expect, will reach the district within quite a reasonable time. I refer now to the one to be built by the Government.

In addition to the territory mentioned by Mr. Kirkpatrick I think there is about three or four millions of acres he did not mention—the tract of the Wabigoon—I do not think he has drawn the long bow in any respect. I think there is a bigger heritage than we dream of or than he has referred to, in the immense wealth both from timber and minerals and water power and heat and light to be found in that territory. I fancy it would be greatly to the interest of the Province generally if this paper could have a wider circulation than it will obtain in the publication of the report of the Surveyors' Association Meeting. I thank you for being permitted to speak, and I congratulate Mr. Kirkpatrick on his paper as being very entertaining and instructive.

Mr. Kirkpatrick—I was pressed for time; if I had not been I could have gone on and made the paper twice as long as it now is. There are little spots here and there containing just about a million acres each, but I was only referring to what is called "Northern Ontario," and that has been already described. I was trying to do missionary work there ten years ago; when young men came into the office and saw the plans, I would say to them, "Why don't you go up there, half a dozen of you fellows from York County? If a dozen or twenty of you go up to those townships before you are married and agree to stay unmarried for two years, take up farms contiguous and lend a hand to each other, clear twenty acres each and put up a house, you can then return to Ontario and bring your wives up with you, and the wives won't suffer from the mosquitos and the possible children won't suffer from the bites of mosquitos, and you will have no school taxes for seven or eight

years" ; but the answer invariably was, " It is too far away." I said, " It is exactly as near the centre of the earth as London is, what more do you want? " But now they are tumbling over one another to get up there, whereas if they had gone up there seven or eight years ago they would have been rich men now.

President Dickson—I know that some years ago there was a great deal of emigration from Ontario to Manitoba, and I spent five seasons in Manitoba; I have been over a great deal of Ontario, and I know that there are millions of acres at Wabigoon and other places. If I wanted land I would not go out of Ontario to Manitoba. There is heavy timber on the land, not too heavy to clear, and plenty of water. I have often wondered why people went to bare land when such an area was up there for settlement, better land.

Mr. Barrow—Are these facts known at all in the older countries, in England?

President Dickson—Yes, pretty well.

Mr. Kirkpatrick—Twenty-two thousand pamphlets were published and are being distributed as fast as possible, and any surveyor who has not got a pamphlet can have one for the taking, or if you give me your address I will send it to you. They are being read all over the world at the present day.

Mr. Southworth mentioned the fish, and any of you that have seen and known the length of a paddle, can find the length of a fish, the trout, on the Ogokee. The timber estimator reported, after a great deal of hesitation, that they had all agreed that they would say nothing about the fish that they caught and saw in the Ogokee, which is a tributary of the Albany, but he said, " I have lived on the Nepigon River for twenty years, and I can truly say that the fishing was infinitely better on the Ogokee. The Ogokee is only about three hundred miles long —as far as was traversed—and they have a picture—you all know what the width of a clapboard is—of speckled trout hanging covering three or four of these clapboards, and you can fancy what the trout are up there. The Ogokee was not known to contain trout at all, because the Albany does not contain trout, so that they must have got in there from the Nepigon River, which is a unique river, and excepting the Temagami, is the only one I know that has an outlet both ways. You can go up the Nepigon River and (without getting out of your canoe), into the lake and down the other river into the Ogokee. There is no land between, just the same as the Temagami, which

at some seasons of the year runs north, and at others south into the Sturgeon River.

You see pictures of the cattle which are raised at Moose Factory, just as fine looking beasts as you ever saw; and it gives the amount of pounds that the beef weighed at so many months old.

Mr. Aylesworth—Were there any potato bugs found on the green vines in October?

Mr. Kirkpatrick—No.

Mr. Aylesworth—Is the pulpwood to be manufactured into paper or only into pulp?

Mr. Kirkpatrick—That is not settled yet. I do not know. They are manufacturing some kinds of paper at Sault St. Marie.

Mr. Southworth—The Order-in-Council only requires it to be made into pulp.

President Dickson—I do not think the day is far distant when it will be made into paper.

Mr. Southworth—I do not think it will require any further instructions to bring that about; I think Canada will be the paper manufacturing country of the world in ten years.

Mr. Kirkpatrick I think we will have a paper manufacturing plant at the Soo before ten years.

President Dickson—No doubt just as fast as we find the quantity of raw material up there for our industries, those industries will start.

Mr. Southworth—There is a very strong effort now being made by some of the pulp men to prevent the exportation of pulp, but no action has been taken by the Government in the matter.

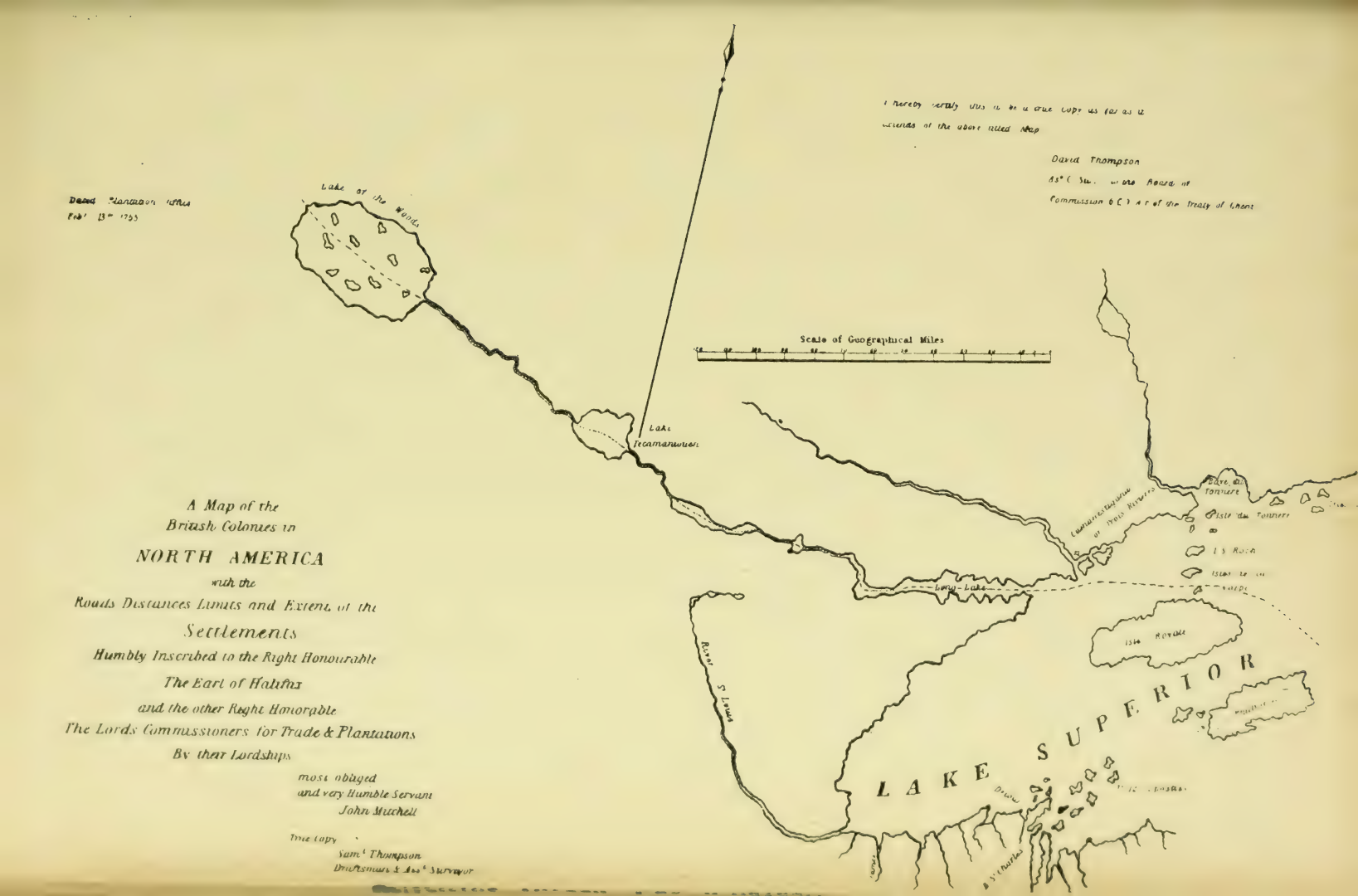
In the explorations that are made isn't there some considerable area still unexplored?

Mr. Kirkpatrick—Yes, a very large area. One explorer went up the Albany to James Bay and back by Moose River.

It was thought to be muskeg, but the timber explorers found it was valuable clay land, which is, of course, as good farming land as you could want. The clay belt is reported to be really good agricultural farming land.

Mr. Southworth—There may be still more clay to the north of that belt.

Mr. Kirkpatrick—Yes; north of that there was found to be muskeg, but it was not explored through, and there may be other clay land there.


A Map of the
British Colonies in
NORTH AMERICA
with the
Roads Distances Limits and Extent of the
Settlements
Humbly Inscribed to the Right Honourable
The Earl of Halifax
and the other Right Honorable
The Lords Commissioners for Trade & Plantations
By their Lordships
most obliged
and very Humble Servant
John Mitchell
True Copy
Sam.l Thompson
Draftsman & Ass.t Surveyor
David Plantation this
Feb.y 13th 1793
I hereby certify this to be a true Copy as far as it
extends of the above titled Map
David Thompson
Ass.t Sur. to the Board of
Commission B.C. A.t of the Treaty of Ghent
Scale of Geographical Miles
Lake of the Woods
Lake
Tecamamiouen
Lake Superior
Isle Royale
LAKE SUPERIOR

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

THE NORTHWEST ANGLE.

BY OTTO J. KLOTZ.

Anyone looking at a map of Canada cannot but be struck by the apparently anomalous jog in the international boundary at the Lake of the Woods, and the question naturally arises, "How came this jog?"

This question came before the Association some years ago, without receiving a definite answer. One member volunteered the opinion or suggestion that it was through a clerical error, that "northwest" should have been "southwest," as the southwest angle of the lake is close to the 49th parallel, which from there to the Pacific Ocean is the international boundary.

I shall be as brief as possible, and quote only such parts of treaties as are essential to the matter under consideration.

Let it be premised that the most reliable map at the time, and the one that was used for the negotiations of the treaty of 1782 was that of John Mitchell, dated February 13, 1755.*

In the provisional treaty of 1782, made between Great Britain and the United States, we find in the second article the boundaries described as follows: " . . . thence through Lake Superior, northward of the Isles of Royal and Phelippeaux, to the Long Lake, and the water communication between it and the Lake of the Woods; thence through the said lake to the most northwestern point thereof, and from thence on a due west course to the river Mississippi; thence by a line to be drawn along the middle of the said river Mississippi, until it shall intersect the northernmost part of the thirty-first degree of north latitude. . . ."

Let it be remarked here that at this time the western boundary of the British possesions was the Mississippi River. The whole basin of the Mississippi was originally claimed by France by virtue of discovery.

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* Moore: International Arbitration, p. 80.

On November 3, 1762, France ceded this vast area, known as the province of Louisiana, to Spain.

Following the decisive action on the Plains of Abraham, the western boundary of the British possessions was extended by the treaty of February 10, 1763, between Great Britain, France and Spain, to the Mississippi.

Spain, by the secret treaty of San Ildefonso, of 1800, transferred back to France that part of Louisiana which she held, and in 1803 Napoleon sold the same to the United States for $12,000,000 cash—a small sum for an empire.

If we turn to the map just quoted, reproduced in part in Moore's International Arbitrations, we shall find that the Lake of the Woods is shown as an elliptical area, dotted with islands, and having its longer axis running northwest-southeast, in general trend with the river from Lake Tecamaniouen (Rainy Lake), through both of which the boundary line passed.

From the topography of the country as known then, it seemed natural to continue the boundary line in the same general direction through the Lake of the Woods to its northwest shore, thereby also dividing the lake about equally.

With our present maps, showing many large and deep bays in the Lake, we would perhaps have difficulty in deciding which is the northwest or southwest angle.

On paper the boundary line looked very simple, clear and void of ambiguity, but the future had trouble in store.

The definitive treaty of peace between Great Britain and the United States was concluded September 3, 1783, and by it the boundaries were defined in terms similar to those in the provisional treaty.

At this time neither the latitude of the most northwest point of the Lake of the Woods nor of the source of the Mississippi was known; it was simply surmised that a line drawn due west from the former would strike the Mississippi. This uncertainty was subsequently expressed in the fourth article of the Treaty of London, signed November 9, 1794, as follows:

"Whereas it is uncertain whether the River Mississippi extends so far to the northward as to be intersected by a line to be drawn due west from the Lake of the Woods in the manner mentioned in the treaty of peace, . . . the two parties will

thereupon proceed by amicable negotiation to regulate the boundary line in that quarter. . . . "

Before any steps were taken in this direction, and before another treaty was concluded with Great Britain, the United States acquired by treaty as above stated, the vast territory of Louisiana, whereby her western boundary was extended presumably to the watershed between the Mississippi and the Pacific. In a recent official publication from Washington we read:

" The want of precise definition of limits in the treaty (with France) was not objected to by the American commissioners, as they probably foresaw that this very indefiniteness might prove of service to the United States in future negotiations with other powers. In fact, the claim of the United States to the area now occupied in Oregon, Washington and Idaho in the negotiations with Great Britain regarding the northwestern boundary, was ostensibly based, not only upon prior occupation and upon purchase from Spain, but also upon the alleged fact that this area formed part of the Louisiana purchase. That this claim was baseless is shown not only by what has been already detailed regarding the limits of the purchase, but also by the direct testimony of the French plenipotentiary, M. Barbé Marbois."

By the Treaty of Ghent, December 24, 1814, it was agreed to provide for a final adjustment of the boundaries, and provision was made for the appointment of commissioners to fix and determine (Article VII.) " that part of the boundary line between the dominions of the two powers, which extend from the water communication between Lake Huron and Lake Superior, to the most northwestern point of the Lake of the Woods . . . "

Before steps were taken to carry out the provisions of Article VII., a Convention was concluded October 20, 1818, between Great Britain and the United States, of which Article II. is:

" It is agreed that a line drawn from the most northwestern point of the Lake of the Woods along the forty-ninth parallel of north latitude, or, if the said point shall not be on the forty-ninth parallel of north latitude, then that a line drawn from the said point due north or south, as the case may be, until the said line shall intersect the said parallel of north latitude, and from the point of such intersection due west along and with the said parallel, shall be the line of demarcation between the

territories of the United States and those of His Britannic Majesty, and that the said line shall form the northern boundary of the said territories of the United States and the southern boundary of the territories of His Britannic Majesty, from the Lake of the Woods to the Stony Mountains" (that is, to the Rocky Mountains).

As it was highly improbable that the "most northwestern point of the Lake of the Woods" would lie on the forty-ninth parallel, a jog was to be expected at that point. It might have been northward instead of southward, as the subsequent astronomical determinations of that point necessitated. We see, therefore, that it was through the wording in Article II. of the above Convention that the projection of what is now the State of Minnesota into Canada originated. The northern extremity of this projection is known as "The Northwest Angle."

It may be observed that the boundary line as described in the treaties of 1782 and 1783 from the intersection of the forty-fifth parallel with the St. Lawrence to the Lake of the Woods, is wholly a water boundary, and furthermore, that the Lake of the Woods was on or near the southern limit of the region claimed by the Hudson's Bay Company.

The water boundary was a natural boundary, and had the apparent merit of easy definition. When to this water boundary was to be attached a certain parallel of latitude, as was stipulated in the Convention of 1818, the simplest way was by a meridian. This was done, and we have in consequence the apparently anomalous intrusion of Minnesota.

The above then is the explanation of the jog in our boundary line at the Lake of the Woods. We shall, however, continue the narrative consequent to Article VII. of the Treaty of Ghent.

It was not until June, 1822. that the Commissioners (Messrs. Barclay and Porter) issued instructions to the surveyors as to the work under Article VII. By October, 1824, the surveys were made, but the Commissioners failed to agree on the interpretation of "Long Lake" of the treaty of 1783, the surveys not showing such a lake contiguous to Lake Superior. The Commissioners drew up separate reports for their respective governments in 1827.

No discussion as to the boundary, under Article VII., took place for many years afterwards, and it was not till 1842 that

the differences were settled by the Webster-Ashburton Treaty. By Article II. of this treaty the boundary line is accurately defined from Lake Huron to the most northwestern point of the Lake of the Woods. The latter part of the description reads:

" . . . to the mouth of Pigeon River, and up the said river, to and through the north and south Fowl Lakes, to the lakes of the height of land between Lake Superior and the Lake of the Woods; thence, along the water communication of

Lake Saisaginaga, and through that lake; thence, to and through Cypress Lake, Lac du Bois Blanc, Lac la Croix, Little Vermilion Lake and Lake Namecan, and through the several smaller lakes, straits or streams, connecting the lakes here mentioned, to that point in Lac la Pluie, or Rainy Lake, at the Chaudière Falls, from which the Commissioners traced the line to the most northwestern point of the Lake of the Woods; thence,

along the said line, to the said most northwestern point, being in latitude 49° 23′ 55″ north, and in longitude 95° 14′ 38″ west from the observatory at Greenwich; thence, according to existing treaties, due south to its intersection with the forty-ninth parallel of north latitude, and along that parallel to the Rocky Mountains. It being understood that all the water communications and all the usual portages along the line from Lake Superior to the Lake of the Woods, and also Grand Portage, from the shore of Lake Superior to the Pigeon River, as now actually used, shall be free and open to the use of the citizens and subjects of both countries."

If England in 1782 had stood upon the motto "What we have we'll hold," there would now be no "Northwest Angle." But that is another story.

Note.—The significant part of the map of 1755 is herewith reproduced, together with one of the present time.

DISCUSSION.

Mr. H. DeQ. Sewell—I have been up there, but never really knew how the Northwest Angle had been established. I heard a number of theories, but never before knew how it was actually defined. The true Northwest Angle is in Shoal Lake, probably, because Shoal Lake is really part of the Lake of the Woods. I have always understood that this Angle was a kind of compromise. That the American Commissioners claimed one point, and the Canadians claimed another, and a compromise was arrived at by running up a little creek.

The Americans claimed to go round to the north of Hunter's Island, and the line was struck through to the south of it. I believe that a system of give and take was adopted.

The Canadians claimed Buffalo Bay and the Americans claimed the northwest angle of Shoal Lake, all part of or connected with the same water, and the present plan was adopted as a compromise.

Mr. G. L. Brown—Are not all the waters up there joined together?

Mr. H. W. Selby—Yes.

Mr. G. L. Brown—Would it not be a good chance now, when we are about to arbitrate with the American Government about the boundary at Alaska, to straighten the boundary at the Northwest Angle?

Mr. H. W. Selby—It has given me much pleasure to second this motion. There might be individual rights up there, such as those of the large fishing companies, which could not be interfered with now after so many years, so that I think it might be very difficult to make any change such as has been suggested.

The President then put the motion, and, on a vote having been taken, declared it carried.

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MINE SURVEYING, UNDERGROUND SURVEYS AND PLANS.

BY DEMOREST & SILVESTER.

A few years ago a paper with this title, no matter how faultless in style or complete and explicit in subject matter, would have possessed a merely academic interest to all but a very few of the members of our Association. With the rapid increase in the development of the various mineral resources of our Province during recent years, however, this branch of the profession is engaging more or less of the time and attention of a constantly increasing number of our members.

Just as the surveyor in the southwestern part of Ontario develops, sooner or later, into a drainage engineer, so the surveyor in New Ontario finds himself compelled to become familiar with mining work.

The average "mining expert," as far as he is in evidence in this part of the world at least, is brought to a sudden halt when confronted with any instrument work. Thus the mining engineer who is also an O.L.S., and therefore thoroughly conversant with all kinds of instrument practice, has a great advantage over the "mining expert;" and the mining companies in this vicinity are becoming educated up to the point where they expect the man who does their engineering and underground work to be able also to do whatever surface surveying may be necessary in connection with the property.

The importance of obtaining complete and accurate surface plans of any mining property before development work is commenced cannot be over-estimated. Instances could be quoted in this district, where expensive shafts have been sunk and other development work done, completely outside the limits of the property upon which the owners supposed they were working.

When the prospector attempts to develop his own "find," he is usually somewhat short of funds, and naturally wishes to spend every dollar toward showing up the property for a sale. When, however, the man or company takes hold, who intends

to go into legitimate development for mining, a careful topographical survey of the outcrop and the vicinity should be made, and the location of probable buildings and plant decided upon; so that any development work may be done intelligently and with a definite end in view from the commencement. The position of a happy-go-lucky shaft, which might just as easily have been sunk elsewhere, but which, after completion, is thought too valuable to abandon, may often spoil the convenient and economical arrangement of the subsequent hoisting and mining plant.

Frequently, however, the system of developing by shafts, drifts and cross-cuts, or by diamond drill, or by a combination of these, may reveal the ore body in an entirely different form from what was anticipated by the surface showings and formation. In these cases, the most complete plans and surveys possible should be made of all work done, to enable one to decide upon the probable shape and extent of the ore deposits, and the proper location and direction of the working shaft or shafts. We do not recollect any instance where the incline of a shaft has been fixed to suit the convenience of the surveyor. We may say, however, that we have found the most convenient angle to be about 45 or 50 degrees, and the most inconvenient, just less than 90 degrees.

In vertical shafts plumb-bobs are used, hung as far apart as the space between the timbers will permit. Where the shafts are deep, heavy bobs should be used, suspended with fine wire or woven cord. A twisted cord will continue to untwist and stretch for hours. If the bob is allowed to hang in a pail of water, it will come to rest much more quickly, and be less easily disturbed by air currents.

When the line of the shaft is established at top and bottom, whether by transit if inclined, or by plumb-bobs if vertical, intermediate points should be marked on the shaft timbers, a few feet above the floor of each level, where there will be least probability of their being disturbed. For aligning inclined shafts, a diagonal eye-piece on an ordinary transit will suffice in almost every case. For producing the line of the shaft downwards for timbering, etc., the instrument can be set up on the downward production of two points on line higher up. About the only cases where an eccentrically mounted telescope is really necessary, are where a shaft changes its incline, and where a downward production of the shaft line has to be made through a

small aperture in a platform or pentice. We have found the most convenient instrument to be one with the extra telescope mounted vertically over the other. This places the eccentricity in the vertical plane, and obviates all trouble with offsetts, except in the rare cases where such an instrument is used for vertical traverses.

Permanent traverse points should be established on every level, and the traverse connected with the line of the shaft. A traverse point is usually marked by drilling a hole in the roof of the drift, say four or five inches deep, and driving in a dry wooden plug, which will swell with the moisture and fit very tight. Into this plug is driven a small screw-eye, from which a plumb-bob may be suspended. Once these points are established on a plan, it is never necessary to get up the line of the shaft for any further work on that level. Everything possible is done to prevent the necessity of having recourse to the shaft, as that means the cessation of all hoisting operations while the work is in progress.

There are many contrivances, in the way of plummet lamps, discs or cards with slits, etc., for use as sighting points underground; but we have found that a common candle is quite satisfactory for all ordinary work. For short sights it can be held a few inches above the plumb-bob string, the latter forming a dark line across the flame. For longer sights, the open page of a field book may be held behind the plumb-bob string, and when illuminated by a candle held in front and slightly away from the line of sight, forms a white background.

For illuminating the crosshairs in the instrument also, a candle is all that is necessary. When the transit is not provided with hollow axis and reflector, the candle may be held at arm's length in front of the objective, and slightly to one side. The neat lantern, with supporting bracket, should be left in the office to adorn a shelf, together with the short-focus reading glasses which are usually attached to surveyors' instruments, and all other attachments which are not absolutely necessary. The most convenient reading glass is a jeweller's eye-glass, which leaves both hands free, one for holding the candle, and the other for manipulating the clamp and tangent screw. The use of the very short-focused attached reading glasses renders one very liable to get his hair and eyebrows singed with the flame of the candle.

For ordinary work, the drifts are usually considered level from the shafts to the stopes; but where extreme accuracy is required, levels are run along the drifts, and bench marks established, the plugs at the traverse stations serving admirably for this purpose. The different levels of the mine are connected vertically by measurements down the shaft, checks being made wherever possible through winzes.

The nickel-copper ores of this vicinity do not occur in regular veins, but in columnar or lenticular masses, frequently assuming a somewhat spiral form; and a rapid survey of a large stope of this character frequently calls for the exercise of some thought and ingenuity. There are usually a number of drillers and muckers working in the stope, frequently by contract, and all work must be suspended during the survey, as the operation of climbing up and down the steep incline is apt to dislodge loose material, which would endanger the life of anyone working below. So it is highly desirable that the most expeditious methods possible be used.

Any accessible point along the walls or sloping floor of the stope is defined by placing a candle and reading the horizontal and vertical angles, and measuring the incline distance. The best tape for mine work is a light steel one, 5-16 inches wide, 100 feet long, in closed case, and nickel plated, to prevent corrosion from the highly mineralized mine water.

For inaccessible points in the roof we have designed an extension rod, capable of measuring heights of sixty feet or over. This rod is made of wood, in sections, and varies from three-quarters of an inch square at the top to about two inches square at the bottom. The different sections connect with dowel pins, and a candle is attached near the top. The method used is almost the reverse of that of taking soundings in water.

Various refinements of method suggest themselves readily after some experience, when very accurate results are required.

When a proper system of points has been established in a mine, the projection of new work, such as the sinking of new shafts, connecting different points by drifts, winzes, etc., becomes a simple matter. In sinking a new working shaft it is frequently possible to carry on the work simultaneously from different points, by sinking and raising to meet, thus saving a great deal of valuable time. It is simply a case for the exercise of the greatest care and caution, and every possible means should

be used in checking the results, as the work usually involves the expenditure of many thousands of dollars.

Too much care for one's personal safety cannot be taken when working underground. One should be always accompanied by a mine foreman or other experienced miner when going into unfamiliar workings in the mine. On the other hand, when working around a shaft or in other perfectly familiar yet dangerous places, one should be constantly on the alert against that condition of mind so aptly described by the old proverb, "Familiarity breeds contempt."

Fire-damp is never encountered in mines in this formation (Archaean), owing to the total absence of all carbonaceous matter; choke-damp very rarely, and only in unused workings. Care should be exercised, however, on venturing into poorly ventilated stopes too soon after blasting. The gases from the explosion are apt to cause violent headache and nausea, especially to one unaccustomed to them.

A system of examination called "magnetic surveying" is coming into practice in connection with the magnetic ores of this vicinity. It is used as a means of determining the size and shape, both horizontal and vertical, of ore bodies. The instrument used is called a magnetometer. It consists essentially of a sensitive magnetic needle, swinging between pivots, and mounted somewhat similarly to a ship's binnacle, so that it can be used either in the horizontal or vertical plane. An adjustable magnet, to compensate for the normal magnetic attraction of the earth, is attached to the arm carrying the sights; and the normal magnetic variation in azimuth for the vicinity is obtained. The surface over the ore deposit and in the vicinity is then staked out in squares of fifty feet or less, the lines running astronomically in the cardinal directions. The magnetometer is set to read zero both horizontally and vertically, when pointing horizontally in the meridian. Horizontal and vertical readings are then taken with the magnetometer at each intersection. From these readings isomagnetic curves are plotted, somewhat resembling contours on a topographical map. A separate plan is made for each set of readings, one called "Plan of Horizontal Intensity;" the other "Plan of Vertical Intensity." From these plans the probable magnetic poles are defined, giving the major axes of the ore lenses.

The magnetometer is also used as a means of prospecting

for ore; but we believe its usefulness in this respect is confined to localities where the surface of the rock is covered with shallow swamps or earthy deposits, and the outcrop cannot be seen.

To obtain the full benefit from mine plans, they should be revised to date every month. When this is done systematically from the start, such plans form a complete record of progress, showing the extent of any particular working at the end of any specified month, and the amount of work done in such working during any number of months. An original plat should be made on strong detail paper of each level separately, showing all traverse points. These can be extended each month as the work progresses. For very small workings, a scale of ten feet to an inch may be used, but for the average mine, twenty feet to an inch is the most convenient scale. From these separate plans a common tracing is made, showing all the levels. This plan is really a series of horizontal projections of the various levels upon a plane assumed below the deepest workings. The outlines of the different levels may be distinguished by different colored inks up to a certain number, say five or six; but colored inks blueprint very poorly, and it is much better to reserve all colors for rock and ore distinctions. We have adopted another system, which seems to be quite satisfactory. The lines consist of long dashes with groups of dots between, the number of dots indicating the level. Thus, the first level is indicated as follows:—— - —— - —— - ——- ; fourth level, —— - - - - —— - - - - ——, etc. Beyond the fourth or fifth level this becomes too cumbersome, and the dots are replaced by small figures, thus, ninth level, ——9——9——, twelfth level, ——12——12——12——. Notwithstanding any attempt at distinguishing marks for the different levels, any plan showing more than three or four levels, where the ore body is so nearly vertical that the projections encroach on each other, becomes very complicated and confusing to one not thoroughly conversant with the workings in the mine. So it is, if not absolutely necessary, at least highly expedient to have a series of plans, showing the levels in pairs, thus, "surface and first level," "first and second levels," etc., in addition to the general plan of all the levels. It is seldom necessary to examine any level relatively to any other, except that immediately above or below it. In such cases the general plan may be consulted. The extension each month may be shown by fine dotted lines with the date

written on. The general plan need not be revised oftener than twice a year.

It is usual to have two vertical plans or sections, taken in directions at right angles to each other. For some purposes it may be necessary to show an actual section along some given plane, even if such plane does not intersect all the workings. It is more usual, however, to make a series of projections of vertical sections taken in parallel planes. The strike of the planes should be chosen so as to intersect the ore bodies as much as possible along their greatest length; and the position of each plane of section showed on the plan of the corresponding level. Any number of levels can be shown in section on one sheet, of course, as the lines do not overlap as in the horizontal projections.

Where the shape of the ore body becomes very irregular, as in the case of a spiral, for instance, it is very difficult to give an adequate representation with two sections at right angles. In such cases, the most feasible scheme is to show, in addition to the others, a developed section along a series of planes following the spiral.

Red and blue may be used in general to distinguish ore and rock, or as many colors as may be desired for different kinds of rock and varieties or qualities of ore. Surfaces may be tinted on tracings to be sent away, accompanying reports, etc., but colored dotted lines only, denoting boundaries between ore and rock, should be used on the original tracings, as ore surfaces of one month may become rock surfaces at the next revision.

All diamond drill holes should be shown on the plans and sections, as they form a valuable aid in projecting new development work in the mine. Negative results from diamond drilling, however, should not be allowed to override positive indications from actual workings; for diamond drills have a peculiar faculty of following thin seams of rock between bodies of ore, and vice versa also. Nor need a surveyor be surprised to find the actual intersection of a diamond drill hole with some workings several levels below the surface, several feet from the projected intersection on his plan; for these holes frequently describe curves, the drill having been deflected by seams or other inequalities in the ground.

A complete sett of blue prints, showing the latest revision, should always be on file at the mine office, for the daily inspection of the mine captain and the shift bosses. In this way these men become familiar with the workings as they actually are, rather than as they think they are, and have a much more intelligent grasp of the work. Without plans, the work must be carried on more or less at random; and we have seen instances, in mines where no regular systematic surveys and plans were made, of enough absolutely useless work being done in a month to pay for regular surveys for a year.

Section 31 of the "Mines Act" requires that complete plans of working mines shall be filed in the Bureau of Mines every six months, and empowers the inspector to demand complete plans up to date, at the time of his visit. Although we believe this section of the Act has not been very strictly enforced by the Department in the past, we know that a compliance with its regulations is very much appreciated by the inspector, as it greatly facilitates his work.

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THE FIELD OF DRAINAGE ENGINEERING.

BY A. S. CODE, O.L.S.

The field of Drainage Engineering is growing wider as general development goes on, and the public are becoming aware that there is good investment in spending money to drain low, wet lands; but little drainage is attempted in districts newly opened, or where the higher lands have not attained considerable value. But it is only a question of time until this condition exists, and in many parts of the Province swamps, that a few years ago were considered of little value, have become smiling farms that will repay the labor expended in their cultivation, and are of a greater value than the older and higher lands in the same locality. Gradual changes are taking place that render it necessary to amend existing drainage laws. The higher portions of wet lands have become drained and water speeded, so that lower lands have become flooded and what were quiet streams have now become rushing torrents in times of flood, sometimes carrying away bridges and fences; and though the Drainage Act appears clear as to the liability of certain lands to assessment for drainage works to relieve those conditions, there is ever extensive litigation, based upon rights of owners, *constitutionally*, and *as defined by the Drainage Act*, and one can hardly reconcile the judgments given by the Courts and the impressions first received upon reading the Act. On account of the difficulty of compiling a report on drainage schemes to agree with judgments given, the labor of engineering the larger drainage works falls to Engineers who have made a specialty of that particular branch, and no small share of the practice of such is composed of Court work.

The principles of drainage assessments appear simple enough at first sight, but to properly apportion Benefit, Outlet Liability, and Injuring Liability, Assessments in a drainage scheme of more than the average scope, requires a general idea of proportion and a skill only attained from experience. The construction placed upon the different classes of assessments by the Courts

appears to be quite clear, but the means of determining the proportion of Injuring Liability seems to me the more difficult, and is only accomplished by a careful examination of each particular parcel for artificial work and a reduction comparatively for each parcel to some mathematical basis assumed to gauge the increase over " nature's speed," and even having accomplished this much, the Engineer is generally required to show that the basis assumed is a fair one, particularly where an appeal is made to the Drainage Referee.

The dangerous flooding of large creeks is becoming a matter of no small moment to owners of lands adjacent, and difficulties appear where the cost of work necessary to relieve the injured lands is larger than, or nearly as large as, the benefit to be conferred by the drainage work. It is to be hoped that the coming legislation will throw new light on the matter, or at least afford some means of relief. A number of schemes were abandoned last year from this cause , and a large percentage of creeks might be placed in this class.

The adoption of a system of indexing field-books, plans, profiles, reports, etc., for office reference, is good policy, and a system of levelling which will check the errors of inexperienced rodmen will be found invaluable. Short and simple methods of work in the field are sought in drainage work, and the system of notes to occupy little space is to be preferred to a cumbersome, tedious method.

In flat country, permanent Benchmarks should be established, and the levels taken on different drains, connected and reduced to a common datum, form valuable information which may take the place of a topographical survey for practical purposes, and which may also be found of service in the matter of evidence.

The number of drainage Engineers appears to be in excess of the demand at present, as a number of Township Councils employ some local man — perhaps a farmer with a fair education, who has purchased a level and studied some method of levelling— at the handsome figure of about $2 per day, who attends Ditches and Watercourses Act drains, but there is always a demand for the Engineer or Surveyor who makes a specialty of drainage.

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TRANSPORTATION.

BY H. DEQ. SEWELL.

Looking for a subject on which to found a paper sufficiently interesting to the members of our Association, without trenching too largely on the special ground of our sister profession (civil engineering), is always a matter of more or less difficulty.

Our standard subjects are principally those relating to land surveys, and to these may be added standards of measurement, drainage, mining, and a few other kindred subjects. These, owing to their limited area, have all been more or less well threshed out, and to write such a paper would necessarily entail considerable repetition.

To discover a subject that would be of sufficient interest to the profession, and at the same time to avoid the necessity for considerable repetitions, has always appeared to me to be vastly more difficult than the subsequent writing, but whether or not I have avoided these rocks in the selection of my subject on this occasion, I must leave you to judge.

The subject of "Transportation" necessarily presents many points of interest. Who is there who has not at some period of his existence been considerably interested in the subject of packing pork, beans, flour, and other kindred articles through our dense primeval forests, to feed a crowd of hungry men during the period occupied in making a survey? And who of us has not had his peace of mind seriously disturbed at the bare suggestion of those indispensable articles running short, or at the prospects of a dog team loaded with provisions being delayed owing to a snowstorm, if it should be winter, or a delay caused by a canoe being windbound, should it be summer time?

The surveyor is only the first pioneer in the progressive encroachments of man upon

"The shadowy desert, unfrequented wood,"

filling the intermediate or transition stage between nature and civilization, to

"Return again, as from a voyage rich with merchandise,"

followed in turn by the colonization road, the thrifty settler, who clears his farm out of the forest, and last but not least, by the railway, that supplies his needs and affords transportation for his surplus products.

In Canada the transportation of our surplus farm products is necessarily one of the burning questions of the day. So far as Eastern Canada, and for that matter a considerable portion of Ontario, is concerned, the country is fairly well settled and well supplied with railways and water communications to the Atlantic Coast (their only feasible outlet), and can fairly be left out of consideration, but Western or New Ontario, which covers an immense territory, together with Manitoba and the Northwest Territories, are entirely dependent upon railways, until Lake Superior is reached.

In order to convey some idea of the agricultural products which to a large extent require transportation, the following table, showing land products in Manitoba and Ontario from the latest returns is given, viz.,

	MANITOBA 1901.	ONTARIO 1900.
	MANITOBA.	ONTARIO.
Land under cultivation.....	3,952,003 acres	13,111,292 acres
Wheat produced.....	50,502,085 bushels	30,310,070 bushels
Oats "	27,796,588 "	87,693,261 "
Barley "	6,536,155 "	16,900,751 "
Peas "	16,349 "	14,058,198 "
Rye "	62,261 "	2,357,635 "
Buckwh't "	.....	1,874,261 "
Beans "	.....	820,373 "
Flax "	16,349 "	.....
	84,929,787 "	154,023,549 "
Potatoes produced.....	4,797,433 bushels	21,476,439 bushels
Roots "	2,925,362 "	37,528,043 "
	7,722,795 "	109,004,482 "
Apples produced.....	.....	36,993,017 bushels
Hay and Clover produced...	.....	3,133,045 tons
Tobacco " ...	.....	2,854,900 lbs.

DAIRY PRODUCTS.

Butter produced.....	2,743,090 lbs.	9,113,964 lbs.
Cheese "	1,039,392 "	123,323,923 "
Poultry produced	417,652	9,541,241
Horses "	142,080	617,309
Cattle "	263.168	2,429,330
Sheep "	22,960	1,797,213
Pigs "	94,680	1,771,641

This includes the principal farm products as compiled from the Manitoba and Ontario Government reports, but does not include the Northwest Territories, whose products are considerable.

These statistics are sufficient to show that there are large and yearly increasing crops that require to be transported to the Atlantic seaboard for transhipment to European markets —but this is not all. When the crops are harvested in the fall of the year, there is a sudden rush on the railways for transportation, first to Lake Superior, where navigation commences, and consequently cheaper rates to the Atlantic. This rush causes a complete congestion of the railway traffic, as the following clipping from a recent paper will show, viz.

" In Manitoba and the Northwest Territories there is a grain blockade in nearly every city, village or railroad station. It is not an unusual sight to see ten or twelve elevators, in towns of 1,000 to 1,500 population, all filled to the very doors. The little village of Wolseley is a fair sample of all the small towns along the line of the Canadian Pacific system. This town, with a population of less than 500 inhabitants, has three elevators, which are filled with about 75,000 bushels of wheat. The farmers have organized an elevator company, and are building an elevator of 35,000 bushels capacity. Every building and storehouse is filled to the ceiling with bags of wheat, and the agricultural implement warerooms are piled with wheat to the doors. In front of the retail stores are piled bags of wheat as high as the first floor, and in some instances filling the sidewalk so that the residents have only a narrow path to pass through. In the rear of the main street are forty-five granaries, or temporary buildings, each holding 800 to 1,200 bushels of wheat. Farmers brought in six or twelve waggon loads of wheat each, and finding every available building filled, they bought lumber and put up these temporary buildings. On the platforms of the

elevators are piled hundreds of bags of grain, and alongside of the elevators are thousands of bushels of wheat in the waggons, waiting for a chance to unload. At one time there were sixty-four waggons loaded with wheat in the street adjoining the elevators. Some of the waggons had been here for two weeks without an oportunity of unloading. The farmers leave their loads in the streets so as to be in the next rush to the elevator. The blockade will, however, continue until the opening of navigation. At present there are over 140,000 bushels of wheat in this town, and nearly 250,000 bushels of grain among the farmers in this locality. A farmer at one of the protest meetings, who is well posted as to the wheat crop in Manitoba and the West said that at least 50,000,000 bushels of wheat woud be shipped out, and then there would be over 26,000,000 bushels left for seed and breadstuffs."

"On a basis of nine cents per bushel for moving this wheat crop to Fort William, taking the price charged from the nearest and longest haul of the Canadian Pacific Railway system, that corporation would receive $4,500,000 for moving the crop of 1901. Certainly the transportation problem will assume vast proportions when all the land is planted with wheat."

In a discussion in the Dominion House, on the 10th March, Mr. T. O. Davis said:

"Enough money had, he thought, been spent on canals, and the time had come when a quicker mode of transportation was required than the canals afforded. The difficulty was to get the wheat crop out in the same season it was raised. The wheat depreciated six cents per bushel by being kept over the winter, and this, added to the insurance and cost of storage, made the loss to the farmer when unable to ship it out the same year, something like ten cents per bushel."

It will thus be seen that the West, particularly Manitoba and the Northwest Territories, is entirely dependent upon its railway communications until Lake Superior is reached, from which point there is water communication in addition to the railways, which considerably reduces the cost of transportation to the sea.

The railways in Manitoba are the Canadian Pacific, the Northern Pacific, and the Canadian Northern (the latter recently reached Winnipeg). Besides these there are the Manitoba and Northwestern, and the Great North West Central,

both of which have been absorbed by the Canadian Pacific, whilst the Canadian Pacific and its branches alone supplies the Northwest Territories.

The Canadian Northern will no doubt do much to relieve the annual grain blockade, but all the same it is self-evident that there is urgent necessity for additional, and, if possible, shorter and more economical outlets.

The Canadian Pacific Railway, before the close of navigation, carried 12,000,000 bushels of wheat to Fort William, but of the amount nearly 5,000,000 bushels were shipped to Buffalo, thus leaving only 7,000,000 bushels to be handled by Canadian freighters. The crop usually begins to move about the first of September and continues moving until the first of December, when Lake Superior begins to get ice-bound; and it will thus be seen that there is urgent necessity for some quicker and more expeditious route to cover the ground from Fort William eastward.

The present lake and railway traffic having been thus proved insufficient to meet the demands upon them, the subject resolves itself into the question, What new outlet, if any, can be found to relieve the annual grain blockade? A glance at the map shows that the Hudson Bay, a great arm of the Atlantic, is by far the nearest point for sea shipping, whilst the sea distance from that point to Liverpool is very little in excess of the distance from Montreal to that port, and hence it is not surprisng that attention has been given to this natural outlet from time to time.

So long ago as 1883 a charter was obtained to build a railway from Winnipeg to Fort Churchill, Hudson Bay, 750 miles. This was followed in 1884, when a charter was obtained for the James Bay Railway, from Sudbury to Abitibi Lake, with the ultimate intention of continuing it on to James Bay, 385 miles. In 1898 another charter was obtained, viz., the Ontario and Hudson Bay R. R., to run from Missanabie Station, on the Canadian Pacific Railway, also to James Bay, 450 miles, with the Algoma Railway from Sault St. Marie as a feeler. Another line, from Lake St. John's Railway, in Quebec, to Rupert's River, James Bay, 372 miles, abandoned in 1895. It will be seen that considerable attention has been directed to reach our great inland sea, the Hudson Bay, as one of the best and most desirable outlets for our western agricultural products.

Dr. Robert Bell, of the Dominion Geological Survey, testified before the Dominion Parliament Committee in 1883,

"That the Hudson Bay is open the year round, and open water can be seen from the beach at all seasons. He was informed that on the eastern shore the sea washed against the rock coast all winter. Fishing can be prosecuted earlier and longer in Hudson Bay than in the larger lakes of the St. Lawrence Basin."

Mr. W. A. Charlton, M.P.P., in a report published by the Ontario Government in 1898 says,

"Although the Hudson Bay is open all the year, the entrance to the straits is blocked by the ice coming down from the north, so that navigation between the bay and the Atlantic Ocean is only practicable about four or five months in the year, from August to December. But this would be the time of year when a large proportion of the Manitoba grain could be shipped by the way of James Bay to Europe. It seems to me a strange condition of things that people so progressive as we are in Ontario, having for a portion of our northern boundary one of the greatest inland seas in the world, the sea and its attractions for commercial enterprise, should be lacking of any means of communication between our commercial centres and this great field of wealth. If railway communication were established it would be the means of opening up a country hitherto shrouded in a very considerable degree of darkness, and enable us to obtain full and reliable information as to its resources. It would inaugurate a direct trade between Ontario and Hudson Bay, and extend to regions beyond. It would open up for the settlement the fertile belt north of the height of land, and make available the mineral and timber resources of an extensive country."

Mr. Chas. T. Harvey, C.E., in a report published by the Ontario Government in 1898, divides the business that would result from a railway to Hudson Bay, in addition to the trade derivable from shipments across the Atlantic, under the following heads, viz.,

1. Forestry products.

2. Fisheries.

He says:

"North of the Canadian Pacific Railway the timber is of medium growth, of which my observation leads me to estimate

that 50 per cent. is poplar of the two leading varieties, 25 per cent. spruce, and 25 per cent. tamarac, white cedar and other varieties.

"The establishment of pulp mills at the water powers along the river will no doubt follow the advent of railway communications through the valley, and afford means of utilizing the pulpwood so abundant in that region."

On the subject of fisheries he says:

'The whale fisheries heretofore exclusively carried on by New England will be transferred to Ontario, and the whaling rendezvous at Marble Island will be abandoned, because steamers wintering at Fort Albany can reach the same ground several weeks earlier."

A successful whaling captain, who has spent seventeen years at Marble Island, or in the Roe's Welcome Straits, informed him that he estimated that the profits of the trade if prosecuted from a terminal in Ontario would be $250,000 a year. The Right whales, which are worth from $10,000 to $20,000 each, pass from Hudson Bay by the inland channels to the Gulf of Bothnia, and thence to the Arctic Ocean, and vice versa.

Another of his informants "captured five of them in a single season, and estimated that he saw 150 passing north through the whaling grounds, which they frequent for only a few weeks each spring."

"Another sea industry that will concentrate at the railway terminus on James Bay is salmon fishing. Salmon abound in all the waters flowing into the sea in that region. The rivers emptying into Ungava Bay are especially prolific in salmon. Their home also extends to all the great rivers emptying on the east coast of the northern sea.

"He estimates that the salmon fisheries should at least equal in value those of British Columbia, which now yield a cash value of $4,000,000 annually. Hence he considers $1,000,000 a safe valuation shortly after the railway facilities reach James Bay."

Dr. Bell says:

"About thirty different species of fish are already known to occur in Hudson Strait or Bay, or in the waters falling into them. They include cod, salmon, sea trout, speckled and grey trout, greyling, halibut, the large whitefish, capeling (the food of the cod), and others."

From the above it will be readily conceded that what is most wanted is a shorter and consequently cheaper transportation to the seaboard, and that this can be best obtained by securing access to the Hudson Bay by a short route starting from a point near to the Canadian outlet on Lake Superior, viz., Port Arthur or Fort William, where it can connect with the Canadian Pacific and the Canadian Northern Railways.

The Lake Superior, Lorg Lake and Albany River Railway, which has passed during the present Session will, I think, fill those requirements better than any other. Starting from Peninsula Harbor, it goes north to Land Lake, thence westerly to Pembina Island, on the Kenogami River, a distance of 210 miles, to the navigable waters of the Albany River; from there transportation by river steamers can be made to Fort Albany, at the mouth of the Albany River, until the road is built to that point, a total distance from Lake Superior of only 400 miles. The distance from Fort Albany to Liverpool is only a trifle longer than that from Montreal, thus practically effecting a saving equal to the cost of transportation from Fort William to Montreal, of at least one cent per bushel on wheat, and this route will be open from August to December, and further, it will afford a cool route for the transportation of meat and grain, etc., and thus, by avoiding heating, enable the produce to be delivered in better condition in Europe.

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CONCERNING THE CONSTRUCTION AND MAINTENANCE OF ROADS IN THE PROVINCE OF ONTARIO.

BY HENRY SMITH, O.L.S.

Superintendent of Colonization Roads, Dept. of Crown Lands, Toronto.

There are two classes of roads which may be considered; namely, those which have been opened and maintained almost entirely, without Government aid, and known as Municipal roads; and others opened by the Government and better designated as Main or Colonization Roads.

MUNICIPAL ROADS.

The Province of Ontario, so far as now surveyed and largely settled, and dating back to the latter part of the 18th century, has been, speaking generally, laid out into rectangular townships, averaging in size about eight miles in width by nine or ten miles in depth. This area is divided into blocks a mile and a quarter square, with a road allowance sixty-six feet in width (one chain) surrounding each block of 1,000 acres, and each block is again subdivided into lots of one hundred acres, the lots extending in length to the centre of the block, with a width or frontage of a quarter of a mile. The earliest surveys were somewhat different, the lots being in many instances one-half wider than those mentioned, and correspondingly shorter, but the system above described has been adopted in the Province since, at any rate, about 1850.

A still newer method has, however, been carried out within the past twenty-five or thirty years, where in the rougher districts, road allowances, if laid out upon the land, are often impracticable; namely, to subdivide the land into sections of one mile square, and instead of laying off an allowance for road purposes, making a reservation of 5 per cent. from each lot, leaving it with the Government or Municipality to determine where roads shall be laid out and constructed.

As early as the year 1810, an Act was passed, appointing by authority of Justices of the Peace, Surveyors of Highways for the purpose of laying out, amending and keeping in repair the roads; and the same Act set forth that all allowances for roads upon which public moneys have been spent in opening the same should be public and common highways. These Justices had authority, where a majority deemed it expedient, to order an expenditure not exceeding £50 ($200), to be spent out of the District Treasury, (a District including many townships). Further Acts were passed for the purpose of granting money from the Provincial Funds for the purpose of amending, repairing, opening up new roads and building bridges within the several Districts of the Province.

In the year 1819, the system of Statute Labor was regulated, whereby owners of property were required to perform and do work upon public roads, and then to the extent of two days' labor upon an assessment of £25, three days' upon £50, and so on; or an equivalent in money or otherwise; and a further sum of one per cent. was allowed from the Treasury upon all collections of each District for road purposes.

An Act was passed in 1832, granting money to be raised by Debentures for the improvement of roads and bridges; and in 1833 a similar Act was brought before the Legislature. The following year pretty large sums were voted for main roads throughout the various districts; while in 1836 the sum of £50,000 was granted, and, with some amendments at the next session, spent in whole or in part upon Main Roads.

While, however, a considerable sum of money was spent by the Government upon roads passing through various municipalities and characterized as Main Roads—being in reality the stage and sometimes military routes, constructed in advance of the railway systems of travel, now so universal throughout the Province,—it is safe to affirm that the chief duty of opening up and maintaining the greater number of them in the Province has fallen upon the settler, who, it may be said, individually cut out his own highway, and, assisted by municipal grants and the statute labor system, formed them into the present generally good country roads.

Under the Trades and other Companies Act,—Chap. 49, 22 Vic.—any number of persons not less than five were given power

to form a Company for the purpose of constructing over any public highway or other lands under certain conditions and restrictions, a plank, macadamized or gravelled road, with bridges, etc., and such Companies were empowered to sell out to municipalities, who would then possess all the Company's rights, among which were the power to levy tolls and charges upon persons passing or using the road, and for vehicles, horses, cattle, or other animals, the rates being limited to about one penny for each five miles, with, in certain cases, power to increase the rate. Changes and amendments have from time to time been made in the Act, but its main features, so far as roads are concerned, appear to have been generally preserved, as may be noticed by a perusal of the Consolidated Municipal Act, a copy of which is now forwarded.

COLONIZATION ROADS.

Since the Union in 1841 of old Upper and Lower Canada (now Ontario and Quebec), it may be said that the roads constructed in whole or in part by the Government have been almost solely for the purpose of opening up the Public Lands of the Province for actual settlement in the newer and more sparsely occupied portions, and for this object sums have been and are now voted annually by the Legislature. Up to the year 1872 the works for which grants were asked were not as a rule given in detail in the estimates, but a gross sum was voted, and the Department under whose charge the expenditure was entrusted decided as to the roads and bridges upon which to expend the money. Since that date, however, a statement has been made annually of the particular roads and bridges upon which the Government asked specific sums for construction or repair, and this statement, with a small lump sum for new short roads, repairs and contingencies, is submitted to the House in the estimates. All these works are carried out by the Government, except in a few special cases where organized Municipalities or Companies are sometimes allowed small sums as contributions towards the building of a bridge or road and the Municipality or organization allowed to do the work, subject to the approval of the Department before the amount is paid over. In some cases the Municipalities or Companies join with the Government in appropriating money for a particular work, as for example a bridge cost-

ing say, $1000, may be built jointly by Government and a Municipality or Company, each contributing a moiety or a portion of the cost, and in such cases it is the usual practice that the contribution of the Municipality or other contributor be passed into the Treasury of the Province and spent under the direction and management of the Government, and as far as known this system has been generally satisfactory.

As to the class or classes of roads: in the earliest part of the history of these works they were arranged into two or three classes and let by contract or tender under a specification in which the character of road was set forth; but for the last eighteen years or thereabout each work has been treated as a distinct matter, and ordered with reference to the circumstances of the case as to whether an expensive or a cheap class of work would sufficiently promote settlement or the interests of the settlers until they might be in a position to maintain the roads without further aid from the Government, and then work is done under an overseer who gives bonds for the due and faithful performance of the work, and then he is again subject to minute instructions from time to time from an Inspector duly appointed, and whose duties are set forth in a copy of Instructions transmitted.

At the close of the season all the works are reported in detail by the Superintendent of Colonization Roads as in the Commissioner's Report, also forwarded, and which, together with "Rules and Regulations," etc., etc., enclosed, may sufficiently explain the system of road making as practised in this Province.

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CONCRETE CULVERT TILE.

BY A. W. CAMPBELL.

The use of Portland cement in building construction is of growing interest to the Engineer. New applications are constantly being suggested, and its adaptability to varied circumstances is one of its most valuable characteristics. Wireless telegraphy, the Roentgen rays, and many other of the later discoveries, have been flashed upon us unexpectedly out of the darkness. Unlike these, the wide range of applications of Portland cement have grown before us slowly, out of a gradual experience, until, massing them all together, this material has become one of the wonders of the day.

While the broader view of the situation brings to us something of amazement, it is in detail that we as builders must, for practical purposes, consider it.

Its use in roadmaking affords a view of some of its most remarkable qualities, but it is to only one of these applications I desire to draw the attention of the Association—a seemingly very modest use—the making of tile culverts. The number of these culverts on country roads varies greatly. Ordinarily half a dozen are needed to each mile of road, if proper drainage is provided. The result has been that in constructing and maintaining a large number of wooden openings under the roads, very many townships have annually spent a considerable portion of their expenditure available for road purposes. These small culverts are themselves constantly out of repair, forming an obstruction to travel and the free use of the roads. The end has therefore been two-fold, in that they absorb so much of the money available for road improvement, and at the same time display almost human ingratitude by their obstructionist tactics. There are not a few townships in the Province which annually spend on small culverts one-half or two-thirds of their annual road appropriation. It is not the least of the good offices of Portland cement that it promises to aid highway improvement very largely in this respect.

The manufacture of concrete tile for culverts is a very simple matter, and can be undertaken by the municipalities themselves, although in a number of cases they are now manufactured as a private enterprise.

The implements required are of the simplest kind. The most important are two steel spring-cylinders, one to set inside the other, leaving a space between the two equal to the thickness of the finished concrete pipe. By "spring-cylinder," it may be explained, is meant such a cylinder as would be formed by rolling a steel plate into a tube without sealing the joint. With the smaller of these cylinders the edges overlap or coil slightly, but are so manufactured that the edges may be forced back and set into a perfect cylinder. With the larger, the edges do not quite meet, but may be forced together and fastened. Accompanying these molds are bottom and top rings, which shape the bell and spigot ends of the pipe.

The two cylinders, with joints flush, are set on end, the one centrally inside the other, and on the bottom "ring," which in turn rests on a firm board bottom. The concrete, made of first-class cement and well-screened gravel, in the proportion of one of cement to three of gravel, is then tamped firmly into the space or mold between the two cylinders. The tamping-iron used to press the concrete into place is so shaped as to fit closely to the cylinder.

The concrete is allowed to stand in the mold for a short time, when the cylinders are removed; the outer and larger cylinder by removing the clamps, and allowing the edges to spring apart; the inner cylinder by removing the fastenings, so as to allow the edges to again overlap, returning to the shape of a coil. The outer cylinder having thus been made larger, and the inner one smaller, they can be readily taken away, and the concrete pipe is then left until thoroughly hardened. For the larger sizes, the two halves of the outer cylinder are usually hinged, and can be more carefully removed than when allowed to "spring" from the concrete.

Just such a number of pipe as are actually required for the season's work need be manufactured; the implements required are inexpensive, and the pipe may be made by the municipality for actual cost, which, after a little experience, can be reduced to a very small amount.

The concrete adheres closely to the metal, and to overcome this it is necessary to keep the molds well oiled. This should be done after each tile is made, and when the molds are by this means kept perfectly clean, a smooth and uniform pipe of good appearance will be obtained. A good mixture for oiling the molds is composed of two parts of machine oil to one part of coal oil.

To secure a durable pipe, it is necessary to use much care in mixing the concrete. Portland cement should be used. If gravel is used, it should, first of all, be clean. Any earthy material, clay or vegetable mould, will create a flaw in the pipe, which will lead to its early destruction, and durability is the quality to be most desired. The gravel should be of such a size that it will pass through a one-half-inch screen, and should be of varying sized grain, in such proportions as to make a compact mixture. The gravel forms the greater part of the mass of concrete, and it is evident that the results will depend very largely on the quality of the gravel.

The materials should be mixed in the proportion of one part of Portland cement to two parts of gravel. They should be first turned over in a dry state until thoroughly intermixed and of a uniform color. Water should then be added. This, like the gravel, should be clean, and there should be just enough to moisten the mass of concrete, making it of the consistency of a stiff mortar. An excess of water tends to injure concrete in various ways, and is especially to be avoided in the manufacture of tile, as the tamping cannot be properly performed when too much water is used. When the water has been added, the mixture should be made uniformly moist, by turning it over three times with a shovel.

The concrete is then ready to be placed in the molds, in which it should be firmly and vigorously tamped.

Just enough concrete should be mixed as can be put in the molds before the process of settling has commenced, and it is therefore of importance to know how long a cement can be worked before setting begins. Ordinarily it is best to mix just such a quantity as will fill one mold at a time. Remnants of concrete which have commenced to set should be thrown away, and under no circumstances should they be worked up again and used, as they are certain to cause a defective pipe. Defects

which do not appear until after the tile have been placed in a culvert and covered with earth, cause not merely the loss of the pipe, but a considerable outlay for labor is wasted as well. The concrete should be handled quickly. Two men are needed, one to shovel it into the molds, and the other to tamp it. From twelve to fifteen feet of pipe, of ten to twelve inches diameter, is an average day's work for two men.

Until the concrete has hardened sufficiently the molds should not be disturbed. When the pipe has attained sufficient strength, which it should do in from five to seven hours, according to the temperature of the atmosphere, and the kind of cement used, it can be turned end for end, thereby taking it off the bottom rings, and the molds may be removed. To enable the pipe to set satisfactorily, they should be dampened every day for several days, if the weather is dry, and they should be protected from the direct rays of the sun in hot weather. They should not be used for some time after being made, but should be allowed to season for from four to six weeks.

The molds for manufacturing these tile may be obtained in various sizes, the more common being for tile ranging from ten to thirty inches in diameter. The ten-inch tile is made about one and three-quarter inches thick; the twelve-inch tile, about two inches thick; the fifteen-inch tile, about two and one-eighth inches thick; the eighteen-inch tile, about two and one-quarter inches thick; the twenty-four-inch tile, about two and one-half inches thick; and the thirty-inch tile, about three and one-half inches thick. Molds for making twelve-inch pipe cost about $12 per set; for fifteen-inch, about $14 per set; for eighteen-inch, about $17 per set; for twenty-four-inch, about $21.50 per set; and for thirty-inch, about $26. The molds are such as to manufacture pipe about two and a half feet long. One set of bottom rings—those for forming the bell of the pipe—go with one set of molds, but it is advisable to have about three sets of bottom rings for each pair of cylinders, to permit the maximum number of pipe to be made in a day.

REPORT OF ENGINEERING COMMITTEE.

MR. PRESIDENT,—Your Committee on Engineering beg leave to submit the following report:

The list of members, with their titles, appended to the last Annual Report of this Association, shows that a large number of Surveyors are engaged in Engineering pursuits, so that papers specially dealing with those branches of Engineering which commonly fall to the lot of the ordinary practising Surveyors are very acceptable, and are read with much interest by the members of this Association.

Roadway construction, embracing, as it does, the roadway proper, with the necessary bridges and culverts to convey it, is a branch of Engineering which the Surveyor is frequently engaged in, and papers on this subject are especially desirable. The great interest lately displayed throughout the Province in connection with good roads, will, no doubt, result in the repairing or reonstruction of many badly built roads, the engineering of which vill probably engage many Land Surveyors.

With regard to the Civil Engineers' Bill lately presented to .he Ontario Legislature by the Canadian Society of Civil Engineers, your Committee believe that while the Bill as presented in 1899 met with the general approval of this Association, the one now proposed omits several clauses strongly recommended and considered important by a Special Committee of the Association (in 1899), and is therefore not entirely satisfactory.

All of which is respectfully submitted,

ERNEST G. BARROW,

Chairman Engineering Committee.

DISCUSSION.

President Dickson—Mr. Chipman, a good deal of your work is engineering, and you might make a few remarks on this paper.

Mr. Chipman—As you have called on me I would like to make one remark respecting the Engineers' Bill. As you are aware, I was Chairman of the Committee in 1899, and we took a great deal of trouble to draft a Bill that would be satisfactory not only to the Engineers throughout the country, but also to

the Land Surveyors. We did not know what opposition there would be to the Bill until it was presented, and the opposition, when it did come, came from quarters that we least expected. The opposition was unreasonable, but still it was such that we had to bow to the storm and withdraw the Bill. The Bill this year was probably not drafted as carefully as the other was. I was not a member of the Committee this year and I did not see the Bill until after it was presented to the House. There were a great many clauses omitted; it was cut down very much. I understood though, from the Chairman of the Committee, that although it was cut down, it would not affect the Land Surveyors in any way whatever—I do not know that it would. However, the Bill has been withdrawn, and the matter must come up again, and no doubt it will be passed sometime.

Major Sankey—Mr. President, I think that possibly it is proper for me to make some remarks on this matter. First of all, I should say that the first thing we knew about this Bill that has recently been presented to the Legislature of Ontario, was after it had received its first reading—after it was printed. It just came to us in the ordinary way of business. In 1899, as Mr. Chipman has just stated, a Committee was appointed by our Association—I am talking from memory now—and I was Chairman of the Committee, as far as I remember; Mr. Niven, Mr. Kirkpatrick and two or three other surveyors—some of them more particularly interested in engineering than the rest of us were, were on the Committee; we met Mr. Chipman, Mr. Jennings, Mr. Hertzberg, and I do not recall now the name of the other gentleman, who was a member of the Engineers' Association Committee. I have before me now the Bill that was then presented to the Committee. It was an amendment to the Bill that came before the House. In that Bill the standing of an Engineer was strictly defined; the condition under which an Ontario Land Surveyor was to become a member of that Association, if he chose to pay his fees and show his certificate, and the condition on which an apprentice would be received, was also defined. The position of a surveyor who became such after the passing of the Bill was also defined; and then there was another clause, which is similar to our own, that any Engineer who desired to withdraw from practice and who gave the Secretary notice of that desire, could have his name removed from the practising list and afterwards come back

again and be a practising Engineer without paying up back dues. I think those were the particular points. There is just one other clause, "That nothing in this Act shall be deemed to encroach upon the rights or privileges conferred upon the Ontario Land Surveyors by any Act of the Legislature of this Province." The Association sent out a circular, stating that these several points had been discussed, and that we had come to the conclusion that as an Association they were satisfactory to us. Nobody, as far as I know, took any exception to the tenor of that circular. Out of these three or four clauses of the 1899 Bill there were only two in the Bill that came before the House just recently.

I had not the authority of this Association to say to the Engineers that I could represent them. I discussed the matter with Mr. Kirkpatrick and Mr. Van Nostrand and other members of the Association who were in Toronto; and I went to some of the Engineers who were interested in this Bill and I said to them, "Out of five clauses that we asked for in 1899, and we were willing to support your Bill, you have only put two in this Bill. What are you going to do about it?" Mr. Rust, the City Engineer of Toronto, said, "We are quite satisfied that the clauses of the 1899 Bill should come in now." I said, "Who is going to put them in?" He said, "You had better attend yourself." We were prepared to attend ourselves to put those clauses in the Bill, with their assurance that they were not going to object to it. It seems to me now that we should give a definite expression of our opinion as to how far we are going to support the Bill, and once we have done so, we should actively support it. Personally, I think that an incorporation of Ontario Engineers is just as advisable as an incorporation of Ontario Land Surveyors; I think it is a move in the right line, but I also think that we should get some little consideration. Our examinations are sufficiently specific; the colleges cannot say that we are behind them, and we should get some recognition for the class of examination and the class of service we require. If a similar service, and a similar examination is required by the Engineers, I think we could very easily reciprocate with them. I do not think we require any change in the Act of Parliament. As our Act now stands, the Board of Examiners have it in their power to say that any man who has passed a qualifying examination, such

as that of the School of Practical Science, should get credit for the same; and I think it is quite correct and proper that he should do so. Now that this Bill has been withdrawn for this year, it would be wise for the Ontario Land Surveyors to put their names down and define the Bill they will support. The Engineers may have as high a standard or a higher than ours, but we require some recognition of ours, and I think it would be wise for us to-day to say what ground we take. If their preliminary examination is as good as ours, let us recognize it; let us say to their candidates, "You have passed this examination and we will allow you to file articles with us and go on for your final examination; and if they require two years more for an extra certificate as an Engineer, we should not stand in their way. We believe that three years' service as apprentice is little enough for a man who has had no previous experience, and I can assure you that one year's service after getting a School of Science or Military College certificate is a very short time in which to learn the practical business of an Ontario Land Surveyor. I am satisfied, and I am sure there are other members in the room who will back me up, that a practical knowledge of the laws of survey, drainage and other things we have to contend with is an absolute necessity, and that there are very few men in this Province who have such an extensive practice that a student can possibly get a practical insight into all classes of surveying business in one year's service. If the Engineers say, "We require two years more service," I am not going to say, "They don't want it." They know their own business. As far as I can see from the Quebec and other Acts, I think that our examination is of just as high a standard as theirs, and that we can reciprocate with them; the time has come for us to say where we stand. A short time ago a letter appeared in the Globe, saying that the opposition of the Ontario Land Surveyors in 1899 had killed the Engineers' Bill; now, as Chairman of our Committee in 1899, I wish to say positively, that we offered no opposition. The Bill of that date was the result of a joint meeting between ourselves and the Engineers. And as far as I personally know, the Ontario Land Surveyors supported that Bill; and it is not right to say that in 1899 the Ontario Land Surveyors killed it. We are not opposing an incorporation of Ontario Engineers or a Canadian Society of

Engineers in any way. I hope that some expression of opinion will be given to let the Engineers know exactly where we stand; and I hope that once we are satisfied about the Bill the Ontario Land Surveyors will put their shoulders to the wheel and help the Bill through.

LIST OF MEMBERS.

31st July, 1902.

The names of those members granted exemption by By-laws ratified by the Association are marked *.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Abrey, George Brockitt, Toronto Junction, ...10th Jan., 1860
D.L.S.

Allan, John Richard, Renfrew.....6th Nov., 1894
Grad. S.P.S.

Aylsworth, Charles Fraser, Jr., Madoc.....8th Jan., 1886
D.L.S.

Aylsworth, John Sidney, Selby, P.O. Box 23...9th Jan., 1871
D.L.S.

Aylsworth, William Robert, Belleville,
P.O. Box 2.....8th Nov., 1861
D.L.S.

Baird, Alexander, Leamington.....7th July, 1877
D.L.S., C.E.

Barrow, Ernest George, Hamilton.....4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.

Bazett, Edward, Burk's Falls.....8th July, 1881
D.L.S.

Beatty, David, Parry Sound.....12th July, 1869
D.L.S.

Beatty, Herbert John, Eganville.....8th Nov., 1893
Grad. S.P.S.

Beatty, Walter, Delta.....19th July, 1858
D.L.S., M.P.P.

Bell, James Anthony, St. Thomas.....11th Oct., 1875
D.L.S., Co. Engineer, Elgin. City Engineer, St. Thomas.

Bigger, Charles Albert, Ottawa, 68 Daly Ave..6th Jan., 1882

Bolton, Ellsworth Doan, Listowel..... .....7th Nov., 1899
B.A.Sc. (McGill)

Bolton, Lewis, Listowel.....9th July, 1864
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Boswell, Elias John, Peterborough.....7th Nov., 1896
Grad. S.P.S.

Bowman, Clemens Dersteine, West Montrose. 10th July, 1879

Bowman, Herbert Joseph, Berlin.....7th Jan., 1887
D.L.S., Grad. S.P.S., Treasurer County Waterloo. Assoc. Mem. Can. Soc. C.E.

Bray, Edgar, Oakville.....6th Oct., 1866
D.L.S.

Bray, L. T., Amherstburg.....17th Feb., 1902.

Bray, Harry Freeman, Oakville.....10th July, 1882

Bray, Samuel, Ottawa, Dept. of Indian Affairs..6th Jan., 1877
C.E., D.L.S.

Brown, George Laing, Morrisburg.....19th Feb., 1898
Grad. S.P.S.

*Brown, John Smith, Kemptville.....8th July, 1852
D.L.S.

Browne, Harry John, Toronto, 18 Toronto st..6th July. 1872
C.E.

Browne, William Albert, Toronto,
18 Toronto st.....10th April, 1876

Burt, Frederick Percy, New York, N.Y.....8th July, 1885
Manager and Treasurer Engineering News Pub. Co., 220 Broadway.

Butler, Matthew Joseph, 22 Wellington Place, Toronto.
.....11th Jan., 1878
M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., C.E.

Byrne, Thomas, Sault Ste. Marie.....15th July, 1862
D.L.S.

*Caddy, Cyprian Francis, Campbellford.....10th July, 1860
D.L.S.

Caddy, John St. Vincent, Ottawa, 559 King st..6th Oct., 1866
D.L.S.

Cameron, Alfred John, Peterborough.....9th April, 1889

Campbell, Archibald William, Toronto,
Parliament Building 10th April,1885
C.E. Provincial Instructor in Road Making.

Carpenter, Henry, Stanley, B.A., Sc.
(Toronto Univ,), Collingwood.....25th Feb., 1899

Carre, Henry, 193 Sparks St., Ottawa.....8th Nov., 1861
M.O. & Georgian Bay Canal, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.

*Carroll, Cyrus, Prince Albert, Sask..... 10 Jan., 1860
Mem. Can. Soc. C.E., D.L.S.

Casgrain, Joseph Philippe Baby, Morrisburg...5th Jan., 7188
D.L.S., P.L.S., (Que.) C.E., Assoc. Mem. Can. Soc., C.E., Chief Eng. M. & P.J. Ry.

Cavana, Allan George, Orillia.....8th July, 1876
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Chalmers, John, Port Arthur, per Ont. & R.R. R'y Co.....14th April, 1896
Grad. S.P.S.

Charlesworth, Lionel Clare, Rat Portage.....14th April, 1896
Grad. S.P.S., Agent Bureau of Mines (Ont.).

*Cheesman, Thomas, Mitchell.....11th July, 1856
D.L.S.

Chipman, Willis, Toronto, 103 Bay st.....4th Oct., 1881
B.A.Sc. (McGill), Mem. Am. Soc. C.E.; Mem. Can. Soc. C.E.

Code, Abraham Silas, Alvinston.....14th April, 1896

Cozens, Joseph, Sault Ste. Marie.....7th July, 1875
D.L.S.

*Davidson, Alexander, Arkona.....11th Oct., 1858
D.L.S.

Davis, Allan Ross, Napanee.....8th Jan., 1886
B.A.Sc. (McGill.)

Davis, John, Alton.....5th April, 1878

Davis, William Mahlon, Berlin.....11th April 1885
Grad. R.M.Coll., (Kingston), Town Engineer.

Deacon, Thomas Russ, Rat Portage.....12th Nov., 1892
Grad. S.P.S., Mgr. Mikado Mine.

Deans, William James, Oshawa.....11th July, 1884

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dickson, James, Fenelon Falls.....6th April, 1867
D.L.S.

Dobbie, Thomas William, Tilsonburg.....11th July, 1856
D.L.S.

Dobie, James Samuel, Port Arthur.....21st Feb., 1898
B.A.Sc. (Toronto Univ.).

Doupe, Joseph, Winnipeg, Man., 169 Edmonton st.....13th Jan., 1863
D.L.S., P.L.S. (Man.), C.E. (McGill)., P.L.S. (B.C.).

Ducker, William A., Winnipeg, Man., 334 Pacific ave.....6th April, 1882
D.L.S., P.L.S. (Man.) Swamp Lands Com.

Esten, Henry Lionel, Toronto, 157 Bay st....7th Jan., 1887

Evans, John Dunlop, Trenton.....8th July, 1864
D.L.S., C.E., Chief Eng. Cent. Ont. Ry., Eng. for Weddell Bridge & Engine Works.

Fair, John, Brantford.....13th April, 1875

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Fairbairn, Richard Purdom, Toronto,
127 Major st.....7th Oct., 1876
Surveyor for Dept. of Pub. Works, Ontario.

Fairchild, Charles Court, Simcoe.....9th April, 1894
Grad. S.P.S.

Fairchild, William Howard, Simcoe.....17th Feb., 1900

Farncomb, Alfred Ernest, Regina, N. W. T.9th April, 1895

Farncomb, Frederick William, London,
213 Dundas st.....6th Nov., 1889

Fawcett, Thomas, Niagara Falls.....6th Jan, 1881
Dom. Topographical Surveyor.

Filmore, S. H., St. Thomas. .....17th Feb., 1902

Fitton, Charles Edward, Orillia, Box 142....10th April, 1879
D.L.S.

Flater, Frederick William, Petrolea.....9th April, 1888

Ford, William Butterton, Hamilton,
42 James St., N.....21st Feb., 1898

Francis, John James, Sarnia P.O., Box 304...16th Oct., 1861
D.L.S.

*Fraser, Charles, Wallaceburg.....5th Aug., 1847
D.L.S

Galbraith, William, Bracebridge.....4th April, 1883
D.L.S.

Gamble. Killaly, Toronto, 88 Charles st.....6th April, 1888
D.L.S., P.L.S. (Man.), Captain R.A. (Ret'd).

Gardiner, Edward, St. Catharines.....6th Jan., 1866
D.L.S.

Gaviller, Maurice, Collingwood, Box 164.....6th Jan., 1866
C.E. (McGill), D.L.S.

Gibson, Harold Holmes, Willowdale.....8th Sept., 1891

*Gibson, James Alexander, Oshawa.....7th April, 1855
D.L.S.

Gibson, Peter Silas, Willowdale.....19th July, 1858
C.E. M.S. (Mich. Univ.) D.L.S., Mem. Can. Soc. C.E., Engineer Tp. of York.

Gibson, Wilbert Silas, Willowdale.....21st Feb., 1898

Gillon, Douglas John, Fort Frances.....9th Nov., 1895
Grad. R.I.E. Coll.

Graydon, Aquila Ormsby, London.....8th July, 1[illegible]
City Engineer.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Hanning, Clement George, Preston,
Lock Box 130.....19th July, 1858
D.L.S., C.E, (Trin. Coll., Dublin).

Hart, Milner, Toronto, 103 Bay st.....11th July, 1863
D.L.S.

Harvey, Thomas Alexander, Steelton, Penn...13th Nov., 1893
C.E. (R.P.I., Troy, N.Y.)

Heaman, John Andrew, London,
Albion Building.....16th Nov., 1896

Henry, Frederick, London, Albion Building..7th April, 1887

*Hermon, Royal Wilkinson, Rednersville....13th July, 1857
D.L.S.

Hobson, Joseph, Montreal, G. T. Ry. Office.....3rd Oct., 1855
D.L.S., Chief Eng. Grand Trunk Railway System.

Holcroft, H. S., Toronto .....17th Feb., 1902

Hopkins, Marshall Willard, Hamilton.....13th Nov., 1893
D.L.S., B.A.Sc. (McGill), Assoc. Mem. Can. Soc. C.E., Chief Engineer I.R.R.C.

Hutcheon, James, Guelph.....10th Nov., 1891
Grad. S.P.S., City Engineer.

Irwin, James Moore, Rat Portage.....13th Jan., 1863
D.L.S.

Jackson, James Herbert, Windsor.....16th Feb., 1901

James, Darrell Denman, Michipicoten Harbour...3rd Nov., 1891
B.A., B.A.Sc. (Toronto Univ.)

James, Silas, Toronto, 227 George St. .....19th July, 1858
D.L.S.

Jones, Charles Albert, Petrolea.....8th April, 1881
D.L.S.

Jones, John Henry, Sarnia, Box 194.....10th Oct., 1886
D.L.S.

Jones, Thomas Henry, Brantford.....10th Oct., 1878
B.A.Sc. (McGill). D.L.S. City Engineer.

*Keefer, Thomas Coltrin, Ottawa.....14th Aug., 1840
D.L.S., C.E.

Kennedy, James Henry, St. Thomas.....7th April, 1887
C.E. (Toronto Univ.), Mem. Can. Soc. C.E., Engineer of V.V. & E. Ry.

Kirkpatrick, George Brownly, Toronto,
Dept. of Crown Lands.....13th April, 1863
D.L.S., Director of Surveys.

Laird, James Stewart, Essex.....6th April, 1867
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Laird, Robert, Sudbury..... 11th Nov., 1887
Grad. S.P.S.

Lewis, John Bower, Ottawa, Brunswick House ..... 4th Oct., 1883
D.L.S., P.L.S. (Quebec), C.E.

Lougheed, Aaron, Port Arthur,..... 12th Nov., 1888
D.L.S.

Low, Edward Hamilton, Port Dover..... 17th Feb., 1902
R.M.C.

*Low, Nathaniel Edward, Wiarton..... 11th July, 1856
D.L.S.

Lumsden, Hugh David, Toronto, 63 Homewood ave..... 4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.

Macdougall, Allan Hay, Port Arthur..... 11th April, 1859
D.L.S., Town Engineer.

MacKay, James John, Woodstock..... 25th Feb., 1899

MacKenzie, William, Sarnia..... 11th April, 1896
Grad. R.M.C. (Kingston).

MacKenzie, William Lyon, Cranbrook, B.C..... 7th April, 1887
C.E.

MacPherson, Duncan, Montreal, P.Q..... 9th Jan., 1884
Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. Eastern Div. C.P. Ry.

McAree, John, Rat Portage..... 6th April, 1867
Dominion Topographical Surveyor, B.A.Sc., (Toronto Univ.)

McCubbin, George Albert, St. Thomas, City Engineer's Office..... 9th Nov., 1895
Assist. City Engineer.

McDonell, Augustine, Chatham, 4 & 5 Ebert's Block..... 11th July, 1863
D.L.S.

McDowall, Robert, Owen Sound..... 11th Nov., 1890
Grad. S.P.S., Town Engineer

McEvoy, Henry Robinson, St. Marys..... 10th July, 1875
D.L.S.

McFadden, Moses, Neepawa, Man..... 13th April, 1858
D.L.S., P.L.S. (Man.)

McFarlen, George Walter, Toronto, City Hall, Assistant City Engineer's Office 11th Nov., 1889
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

McGeorge, William Graham, Chatham, Box 225.....8th Jan., 1866
D.L.S.

McGrandle, Hugh, Huntsville.....5th Jan., 1883
D.L.S.

McKay, Owen, Windsor, P.O. Box 167.....7th Jan., 1887
Grad. S.P.S., Chief Eng. D. & L. E. Ry.

McKenna, John Joseph, Dublin.....9th July, 1860
D.L.S.

McLatchie, John, Nelson, B.C., P.O. Box 128....9th Jan., 1864
D.L.S.. P.L.S. (Que., Man. and B.C.).

McLean, James Keachie, Elora.....8th April, 1876
D.L.S.

McLean, William Arthur, Toronto, Parliament Buildings .....21st Feb., 1898
Secretary of Roads.

McLennan, Murdoch John, Williamstown...13th Nov., 1893
B.A.Sc. (McGill), D.L.S.

McLennan, Roderick, Toronto, 115 Avenue Rd.....20th June, 1846
D.L.S.

McNab, John Duncan, Chatham .....9th Oct., 1879

McNaughton, Finlay Donald, Cornwall.....25th Feb., 1899

McPherson, Archibald John, Brockville.....10th April, 1897
B.A.Sc. (Toronto Univ.)

McPherson, Charles Wilfrid, Dawson, N.W.T. c/o Dep't of Interior .....21st Feb., 1899

McPhillips, George, Winnipeg,.....9th July, 1885
D.L.S., P.L.S. (Man.)

Manigault, William Mazyck, Strathroy, P.O. Box 300.....8th July, 1876
D.L.S.

Marshall, James, Holyrood.....6th Oct., 1866
D.L.S.

Meadows, William Walter, St. Thomas.....21st Feb., 1898
Grad. S.P.S.

Miles, Charles Falconer, 268 Triangle St., Buffalo, N.Y.....13th Jan., 1862
D.L.S.

Miller, Frederick Fraser, Napanee.....8th Jan., 1885

Moore, John MacKenzie, London, Albion Building.....9th Oct., 1879

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Moore, John Harrison, Smith's Falls.....11th Nov., 1889
Grad. S.P.S.

Morris, Alfred Edmund, Perth.....10th April, 1879

Morris, James Lewis, Pembroke.....7th July, 1886
D.L.S., C.E. (Toronto Univ

Mountain, George Alphonse, Ottawa.....9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.) Chief Eng. Can. Atlantic and O.A. & B. Ry.

Murdoch, William, Toronto, 37 Bloor St. E.....10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto, 157 Bay st..6th Oct., 1886

Nash, Thomas Webb, Kingston.....7th April, 1854

Newman, John James, Windsor.....21st Feb., 1898

Newman, William, Windsor,
57 Sandwich st. w.....12th Nov., 1892
Grad. S.P.S.

Niven, Alexander, Haliburton.....8th July, 1859
D.L.S.

Ogilvie, William, Dawson City, Yukon Dist..12th July, 1869
D.L.S. Commissioner for Yukon District.

O'Hara, Walter Francis, Chatham.....14th April, 1892
D.L.S.

Patten, Thaddeus James, Little Current.....5th Jan., 1883
D.L.S.

Peterson, Peter Alexander, Montreal, P.Q...16th July, 1863
D.L.S., C.E., Mem. Can. Soc. C.E.

Pinhey, Charles Herbert, Ottawa,
552 Gilmour St.....12th Nov., 1888
D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

Proudfoot, Hume Blake, Port Arthur.....6th Jan., 1882
D.L.S., C.E. (Toronto Univ.)

Rainboth, Edward Joseph, Ottawa.....11th Nov., 1887
D.L.S.

Rainboth, George Charles, Aylmer, P.Q.....11th July, 1868
D.L.S., P.L.S. (Que.)

Reinhardt, Carl, Montreal, 340 Mountain St.....25th Feb., 1899
B.A.Sc. (McGill.)

Reynolds, Samuel Henry, Rat Portage.....17th July, 1880

Roberts, Vaughan Maurice, St. Catharines...5th April, 1887

Robertson, James, Glencoe.....11th July, 1885
Grad. S.P.S.

Robinson, Franklin Joseph, Macleod.....21st Feb., 1898
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Roger, John, Mitchell.....10th Nov., 1888
Grad. S.P.S.

*Rombough, Wm. R., Toronto, 61 Walton St...14th Nov., 1848
D.L.S.

Rorke, Louis Valentine, Sudbury.....14th April, 1890
D.L.S.

Ross, George, Welland.....10th July, 1879
B.A.Sc. (McGill), D.L.S.

*Rubidge, Tom S., Cornwall.....9th Feb., 1849
D.L.S., Asst. Eng. Dept. Rys. and Canals.

Russell, Alexander Lord, Port Arthur.....16th April, 1873
D.L.S., P.L.S. (Que.).

Sankey, Villiers, Toronto, City Hall.....11th Jan., 1878
D.L.S., City Surveyor.

Saunders, Bryce Johnston, Regina, N.W.T.....7th Jan., 1885
B.A.Sc. (McGill), D.L.S.

Scane, Thomas, Ridgetown.....7th Jan., 1865
D.L.S.

*Schofield, Milton C.,
185 14th St. Buffalo, N.Y.....28th Sept., 1843
D.L.S.

Schwitzer, John Edward, Rat Portage.....16th Nov., 1896
Town Engineer, B.A.Sc. (McGill).

Seager, Edmund, Rat Portage.....8th July, 1861
D.L.S.

Selby, Henry Walter, Dinorwic,
Dist. of Rainy River.....8th Jan., 1876
D.L.S.

Sewell, Henry DeQuincy, Toronto, 29 St. Mary St. 9th July, 1885
D.L.S., A.M.I.C.E.

Shaw, John Henry, Pembroke.....17th Feb., 1900
Grad. S.P.S.

Silvester, George Ernest, Sudbury.....12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Toronto;
Room 71, Confederation Life Building..9th Jan., 1879
D.L.S., C.E., Public Works Dept.

Smith, Angus, Stratford.....14th April, 1896
Grad. S.P.S., City Engineer.

Smith, George, Woodville, P.O. Box 77. ...7th April, 1881
Engineer for Co. Victoria and four Townships.

Smith, Henry, Toronto, Crown Lands Dept...8th Nov., 1861
D.L.S., Mem. Can. Soc. C.E.

Speight, Thomas Bailey, Toronto,
Yonge St. Arcade.....6th Jan., 1882
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Squire, Richard Herbert, Brantford,
103 Dalhousie St.....14th April, 1896
B.A.Sc. (Toronto University).

Steele, Edward Charles, Port Arthur.....9th April, 1889
Assoc. Mem. Can. Soc. C.E.

Stewart, Elihu, Ottawa, Dept. of the Int.....8th April, 1872
D.L.S., Chief Inspector of Timber and Forestry.

*Stewart, George Alexander, Calgary, Alta....8th July, 1852
D.L.S.

Stewart, John, Montreal.....11th Nov., 1887
D.L.S.

Stewart, Walter Edgar, Aylmer.....12th April, 1892

*Strange, Henry, Rockwood.....30th Nov., 1838
D.L.S., C.E.

Stull, William Walter, Sudbury.....17th Feb., 1900
B.A.Sc. (Toronto Univ.)

Taylor, William Verner, Gananoque.....7th Nov., 1896
Grad. S.P.S.

Traynor, Isaac, Dundalk.....16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man.,
C. P. R. Eng. Office.....6th July, 1878
D.L.S., C.E. (Toronto Univ.)

Tyrrell, James Williams, Hamilton,
42 James st. n.....8th April, 1885
C.E. (Toronto Univ.), D.L.S., Co. Eng. for Wentworth.

*Unwin, Charles, Toronto, 126 Seaton st....12th April, 1852
D.L.S.

Ure, Frederick John, Woodstock.....7th April, 1887
C.E.

Van Buskirk., William Fraser, Rosland .....7th April, 1888
Grad. R.M. Coll. (Kingston), City Engineer.

Van Nostrand, Arthur J., Toronto,
Yonge St. Arcade.....30th Oct., 1882
D.L.S.

Wadsworth, Vernon Bayley, Toronto,
103 Bay st.....9th April, 1864
D.L.S.

Walker, Alfred Paverley, Toronto, Room 508,
Union Station, C. P. Ry., Eng. Office.....6th Jan., 1882
D.L.S., Mem. Can. Soc. C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Wallace, James Nevin,
Calgary, Alta.....21st Feb., 1898
B.A., B.E. (Trin. Coll Dublin).

Ward, Archeson Thomas,
Wabigoon Dist. of Rainy River .....10th April, 1897

Warren, James, Walkerton, P.O. Box 190.....7th Oct., 1864
D.L.S.

Watson, John McCormack, Orillia,
P.O. Box 224.....13th April, 1892

*Weatherald, Thomas, Goderich,
P.O. Box 273.....12th Jan., 1856
D.L.S., C.E.

Weekes, Melville Bell, Brantford.....17th Feb., 1900
B.A.Sc. (Toronto Univ.)

West, Robert Francis, Orangeville.....7th April, 1881

Wheelock, Charles Richard, Orangeville.....7th Jan., 1886
Treasurer County of Dufferin.

Whitson, James Francis, Toronto,
Crown Lands Dept.....9th Jan., 1886

Wicksteed, Henry King, Cobourg.....7th Jan., 1886
D.L.S., C.E.

Wiggins, Thomas Henry, Finch, Ont.....10th Nov., 1891
Grad. S.P.S., D.L.S., Town Engineer.

Wilde, John Absalom, Sault Ste. Marie.....9th April, 1889

Wilkie, Edward Thomson, Carleton Place...11th April, 1891
D.L.S.

Wilkins, F. W., Norwood, Ont., re-registered May 29th, 1902

Williams, David, 220 Queen St., Kingston..... 9th April, 1864
D.L.S.

*Winter, Henry, Thornyhurst.....11th July, 1853
D.L.S., C.E.

*Wood, Henry O., Billings' Bridge.....10th Oct., 1855
D.L.S.

*Yarnold, William Edward, Port Perry,
P.O. Box 44.....7th April, 1854
D.L.S.

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked *; and under By-Law No. 45 are marked †.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Anderson, John Drummond, Trail, B.C.....13th April, 1892

Apsey, John Fletcher,
Cumberland, Md.....6th Jan., 1886
Grad. S.P.S.

Aylsworth, Charles Fraser, Sr., Madoc.....2nd April, 1861
D.L.S.

Blake, Frank Lever, Toronto,
Meteorological Office .....13th April, 1875
D.L.S.

Bell, Andrew, Almonte.....6th Oct., 1866
D.L.S.

Booth, Charles Edward Stewart,
Westmount, P. Q.....6th April, 1882

Bowman, Arthur Meyer, Mahan,
Beaver Co., Pa.....11th Nov., 1887
Grad. S.P.S., Staff of U.S. Engineers.

Bowman, Franklin Meyer, Bellevue,
Allegheny Co., Pa.....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., P.O. Box 815..15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C.....8th July, 1861
P.L.S. (B.C.).

Carbert, J. Alfred, St. Joseph, Mich.....7th April, 1876
D.L.S. Staff of U. S. Engineers.

Coleman, Richard Herbert, Toronto, Canada
Co. Offices, Imperial Bank Chambers....6th Oct., 1877

Drewry, William Stewart, Ottawa,
Dept. of the Interior.....5th April, 1883
D.L.S.

Edwards, George, Thurso, P.Q.....6th Jan., 1866
D.L.S.

*Ellis, Henry Disney, Kuching, Sarawak,
Borneo .....7th April, 1877
D.L.S., Commr. of Pub. Works and Surveys.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Galbraith, John, Toronto,
School of Prac. Science.....13th April, 1875
M.A., D.L.S., Prof. Engineering S.P.S.

Gibbons, James, Ottawa, Dept. of the Interior...15th April, 1890
Grad. S.P.S., Dominion Topographical Surveyor.

Gibson, George, St. Catharines.....10th April, 1860
D.L.S.

*Gilmour, Robert, Toronto, c/o Western
Loan Company.....11th April, 1856
D.L.S., C.E

Green, Thomas Daniel, Dawson City .....7th Jan. 1885
D.L.S.

Griffin, Albert Dyke,
Collegiate Institute, Woodstock.....11th Nov., 1890
B.A., Mathematical Master.

*Harris, John Walter, Winnipeg .....6th Oct., 1866
P.L.S. (Man.), D.L.S., Assessment Com.

Henderson, Eder Eli, Henderson P.O.,
Maine .....7th April, 1887
Grad. S.P.S.

Hermon, Ernest Bolton, Vancouver, B.C.....7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Innes, William Livingstone, Simcoe.....14th April, 1892
C.E. (Toronto Univ.).

Jephson, Richard Jermy, Calgary, Alta.....7th April, 1877
P.L.S. (B.C.), D.L.S.

Johnson, Sydney Munnings, Greenwood, B.C..9th Nov., 1895

Johnston, Robert Thornton,
New York, N.Y., 944 Amsterdam Ave.....9th April, 1889

Kirk, John Albert, Rossland, B.C.....6th July, 1877
D.L.S. P.L.S. (B.C.).

*Kippax Hargreaves, Huron, South Dakota.....7th July, 1877
C.E. (Toronto Univ.), Assistant to Surveyor General.

*Klotz, Otto Julius, Ottawa, 437 Albert st.....6th Jan., 1876
C.E. (Mich. Univ.), Dominion Topographical Surveyor.

Lane, Andrew, Sparrow's Point, Md.....4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Lendrum, Robert Watt,
South Edmonton, Alta.....8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm,
Winnipeg, Man.....10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa,
340 Cooper st.....11th Oct., 1856
C.E., D.L.S.

McCulloch, Andrew, Lake Nelson, B.C.....
Grad. S.P.S., Assoc. Mem. Can. Soc. C.E., City Engineer,

*McMullen, William Ernest,, St. John, N.B..11th Nov., 1892
Asst. Eng. C. P. Ry.

Magrath, Charles Alexander, Lethbridge, Alta..1st Nov., 1881
B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).

Moore, Thos. Alexander, London South....12th Nov., 1892

Munro, John Vicar, New York, N.Y.,
359 West 31st st.....9th April, 1895

†Paterson, James, Allison, Lauzon, P.Q.....5th April, 1878
C.E., Mem, Can. Soc. C.E.

Pearce, William, Calgary, Alta.....12th Oct., 1872
D.L.S., P.L.S. (B.C.).

Ponton, Archibald William, Ottawa,
Dept. of Interior.....9th April, 1880
D.L.S.

Pope, Robert Tyndall,———— Ireland.....13th April, 1875
C.E., D.L.S.

Purvis, Frank, Mesa City, Arizona.....7th April, 1875

Reid, John Lestock, Prince Albert, Sask.....8th April, 1870
D.L.S.

Reiffenstein, James Henry, Ottawa,
Dept. of the Interior.....16th April, 1873
D.L.S.

Reilly, William Robinson, London,
361 Simcoe st.....7th April, 1881
D.L.S., P.L.S. (Man.)

Ritchie, Nelson Thomas, Kipiegan, Man.....9th Nov., 1888

Rogers, Richard Birdsall, Peterborough.....9th Jan., 1879
B.A.Sc. (McGill), D.L.S.

*Ross, Joseph Edmund, New Westminster,
B.C. .....11th Nov., 1890
P.L.S. (B.C.).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Sanderson, Daniel Leavens, Coral, Mich.....4th Oct., 1882

Shaw, Charles Æneas, Greenwood, B.C.....6th Oct., 1877
P.L.S. (B.C.).

Sherman, Ruyter Stinson, Vancouver, B.C..12th April, 1890
P.L.S. (B.C.).

Simpson, George Albert, Winnipeg Man.....7th Oct., 1864
C.E., D.L.S., M.P.

Spry, William, Toronto.....19th July, 1858
C.E., D.L.S.

*Stewart, Louis Beaufort, Toronto,
School of Prac. Science.....6th April, 1882
Dominion Topographical Surveyor, Lect. in Surveying.

Strathern, John, Vancouver, B.C.....5th Oct., 1876
P.L.S. (B.C.), D.L.S.

Tracey, Thomas Henry, Vancouver, B.C.....8th April, 1870
C.E., P.L.S. (B.C.), D.L.S.

Vicars, John Richard Odlum, Kamloops, B.C..5th Jan., 1887
D.L.S., P.L.S. (B.C.).

Wallace, Charles Hugh, 36 Dame St., Dublin, Ire., 9th Nov. 1889
C.E. (Trin. College, Dublin), Dom. Gov. Surveyor.

Weekes, Abel Seneca, Wetaskiwin, Alta....12th April, 1890
D.L.S.

Wheeler, Arthur Oliver, New Westminster,
B.C. .....8th July, 1881
P.L.S. (B.C.), D.L.S.

Willson, Alfred, Toronto, Can. Co. Offices,
Imperial Bank Chambers.....6th Oct., 1866
D.L.S., Commissioner Canada Company.

SUMMARY.

Active members subject to dues.....	196
Active members exempted from dues	19
Withdrawn from practice (including 9 Associates)	69
Dead	34
Total number enrolled since incorporation.....	318

Deceased Members.

NAME.	LATE RESIDENCE.	DATE OF P. L. S. CERTIFICATE.	DATE OF O. L. S. REGISTRATION.	DIED.
Bolger, Francis	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bolger, Thomas Oliver	Kingston	6th July, 1865	1892	—— ——
Bolton, Jesse Nunn	Toronto	6th April, 1867		————, 1901.
Bowman, Leander Meyer	Toronto	14th April, 1892	1892	20th September, 1895.
Brown, David Rose	Cornwall	10th October, 1850	1892	14th May, 1900.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1897.
Caddy, Edward C.	Cobourg	18th December, 1846	1892	26th September, 1897.
Coad, Richard	Glencoe	8th October, 1879	1882	17th May, 1897.
Creswicke, Henry	Barrie	8th July, 1864	1892	22nd January, 1898.
Cromwell, Joseph M. O.	Perth	1st October, 1846	1892	19th October, 1897.
Davidson, Walter Stanley	Sarnia	9th April, 1884	1882	December, 1900.
Deane, Michael	Windsor	26th May, 1848	19th December, 1882	3rd April, 1887.
DeGurse, Joseph	Windsor	5th April, 1883	1892	22nd March, 1898.
FitzGerald, James William	Peterborough	13th July, 1857	1892	————, 1901.
Foster, Frederick Lucas	Toronto	9th April, 1863	1892	27th July, 1899.
Fowlie, Albert	Orillia	13th January, 1863	1892	—— April, 1898.
Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Gilliland, Thomas Brown	Eugenia	11th July, 1868	25th January, 1890	14th December, 1898.
Haskins, William	Hamilton	5th July, 1855	1892	5th July, 1896.
Hewson, Thomas Ringwood	Hamilton	6th July, 1877	1892	21st October, 1898.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896.
Kains, Tom	Victoria	11th July, 1873		————, 1901.
Kirk, Joseph Green	Stratford	16th February, 1843	1892	22nd January, 1900.
Lynch-Staunton, Francis H.	Hamilton	11th October, 1856	1892	11th June, 1899.
MacMillan, James Alexander	Calgary	6th January, 1877	24th December, 1894	————, 1898.
NacNab, John Chisholm	Hamilton	8th January, 1880	1892	16th October, 1897.
McCallum, James	Fort Francis	30th March, 1849	1892	—— July, 1900.
Malcolm, Sherman Morgan	Blenheim	11th October, 1858	1892	13th January, 1899.
Ogilvie, John Henry	Rat Portage	8th April, 1876	24th April, 1894	21st September, 1898.
Pedder, James Robert	Doon	10th November, 1891	23rd December, 1892	17th January, 1897.
Reid, James Hales	Bowmanville	6th October, 1866	1892	22nd December, 1899.
Robinson, William	London	—— May, 1846	1892	11th October, 1894.
Tiernan, Joseph Martin	Tilbury Centre	7th January, 1886	1892	December, 1900,
Thomas, Augustus Clifford	Chicago	14th January, 1861	1892	—— December, 1896.
Wagner, William	Ossowo	13 April, 1858		————, 1901.
Walsh, Thomas William	Simcoe	25th April, 1842	1892	14th March, 1895.
Wheelock, Charles John	Orangeville	———— ————, 1856	1892	4th July, 1897.

No. 18.

ANNUAL REPORT

OF THE

ASSOCIATION

OF

ONTARIO

LAND SURVEYORS

ORGANIZED 1886. INCORPORATED, 1892.

AND

PROCEEDINGS

AT THE

ELEVENTH ANNUAL MEETING

SINCE INCORPORATION

HELD AT

TORONTO.

FEBRUARY 24th, 25th and 26th, 1903.

PRINTED FOR THE ASSOCIATION BY
HENDERSON & CO., LOMBARD ST.
TORONTO.

PATRONIZE OUR ADVERTISERS.

NOTICES.

Members and others will be supplied with copies of the Annual Report for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, or 1902, upon remitting to the Secretary fifty cents for each copy required.

Copies of the "Manual" may also be had from the Secretary, price fifty cents.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good program is most desirable, and to insure its preparation it is not now too early to bear the matter in mind.

In addition to its use as a library the Repository now serves as a drafting room for members when copying Crown Lands plans and notes.

Published annually by the Association of Ontario Land Surveyors. Edition, 1350 copies; price, 50 cents.

PATRONIZE OUR ADVERTISERS.

CE CE 9

PREFACE.

To the Members of the Association of Ontario Land Surveyors:

The Proceedings of the Association at its Eleventh Annual Meeting are herewith presented.

Respectfully submitted on behalf of the Council,

KILLALY GAMBLE,

Secretary.

P1859
P18959

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ASSOCIATION OF

ONTARIO LAND SURVEYORS

(ORGANIZED, 1886. INCORPORATED, 1892.)

OFFICERS FOR 1903-1904.

PRESIDENT.

W. R. Aylsworth - - - - - - - - Belleville.

VICE-PRESIDENT.

C. A. Jones - - - - - - - - - Petrolea.

CHAIRMAN OF COUNCIL.

G. B. Kirkpatrick - - - - - - - - Toronto.

SECRETARY-TREASURER.

Killaly Gamble - - - - - - - - Toronto.

MEMBERS OF COUNCIL.

Hon. E. J. Davis - - - Commissioner of Crown Lands.

Alex. Niven, Haliburton.
A. J. Van Nostrand, Toronto. } For Term ending April, 1906.

G. B. Kirkpatrick, Toronto.
Villiers Sankey, Toronto. } For Term ending April, 1905.

J. W. Tyrrell, Hamilton.
J. McAree, Rat Portage. } For Term ending April, 1904.

AUDITORS.

J. F. Whitson - - - - - - - - - Toronto.
W. A. McLean - - - - - - - - Toronto.

BANKERS.

Imperial Bank of Canada (Yonge Street Branch), Toronto.

BOARD OF EXAMINERS.

G. B. KIRKPATRICK (Chairman.)

THOMAS FAWCETT, Niagara Falls. JAMES ROBERTSON, Glencoe.	For three years.
G. B. KIRKPATRICK, Toronto. M.J. BUTLER, Montreal.	For two years.
P. S. GIBSON, Willowdale. ALEX. NIVEN, Haliburton.	For one year.

KILLALY GAMBLE (Secretary of Board).

NOTE—Board meets at Crown Lands Department, Parliament Buildings, on Monday, 8th February, 1904.

COMMITTEES, 1903-1904.

STANDING.

TOPOGRAPHICAL SURVEY—Otto J. Klotz (Chairman), F. L. Blake, L. C. Charlesworth, Thos. Fawcett, C. C. Fairchild, John McAree, B. J. Saunders, L. B. Stewart, E. Stewart.

ENGINEERING—E. G. Barrow (Chairman), M. J. Butler, J. Hutcheon, H. D. Lumsden, O. McKay, A. W. Ponton, J. G. Sing, G. E. Silvester, A. P. Walker.

DRAINAGE—James Robertson (Chairman), F. W. Farncomb, C. A. Jones, R. McDowall, W. G. McGeorge, J. H. Moore, Geo. Ross, Geo. Smith, C. J. Wheelock.

LAND SURVEYING — M. Gaviller (Chairman), E. Bazett, James Dickson, Jos. Doupe, J. D. Evans, Wm. Galbraith, G. B. Kirkpatrick, A. Niven, L. V. Rorke.

PUBLICATION — A. J. Van Nostrand (Chairman), H. J. Browne, Willis Chipman, K. Gamble, C. J. Murphy.

ENTERTAINMENT—T. B. Speight (Chairman), H. L. Esten, Killaly Gamble, H. H. Gibson, Villiers Sankey.

POLAR RESEARCH—Willis Chipman (Chairman), Jos. Cozens, Thos. Fawcett, J. E. Morris, L. B. Stewart, J. W. Tyrrell, J. F. Whitson.

REPOSITORY AND BIOGRAPHY—W. A. McLean (Chairman), H. L. Esten, G. B. Kirkpatrick, A. J. Unwin, A. J. Van Nostrand.

SPECIAL.

EXPLORATION—J. W. Tyrrell (Chairman), G. B. Abrey, C. D. Bowman, C. E. Fitton, T. H. Jones, H. B. Proudfoot, W. W. Stull, H. W. Selby, A. T. Ward.

LEGISLATION — Villiers Sankey (Chairman), W. R. Aylsworth, H. J. Bowman, R. W. DeMorest, P. S. Gibson, G. B. Kirkpatrick, A. Niven, J. F. Whitson, V. B. Wadsworth.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED.)

AT ITS ELEVENTH ANNUAL MEETING, HELD AT TORONTO, FEB. 24, 25 and 26, 1903.

PROGRAMME.

Tuesday, Feb. 24th—Morning, 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council.
Meeting of Standing and Special Committtees.

Afternoon, 2 o'clock.

Report of Secretary-Treasurer.
Paper—"Laying out Town Sites." H. DeQ. Sewell.
Report of Committee on Repository and Biography. H. L. Esten, Chairman

Evening, 8 o'clock.

Report of Committee on Publication. A. J. Van Nostrand, Chairman.
Paper—"Notes from an Explorer's Diary." J. W. Tyrrell.
Report of Polar Research Committee. Willis Chipman, Chairman.

Wednesday, Feb. 25th—Morning, 10 o'clock.

AT ENGINEERS' CLUB ROOMS, 94 AND 96 KING ST. WEST.

Report of Council. Villiers Sankey, Chairman.
Report of Board of Examiners. Villiers Sankey, Chairman.
Report of Committee on Land Surveying with Question Drawer. John D. Evans, Chairman.

Afternoon, 2 o'clock.

Report of Committee on Exploration. T. B. Speight, Chairman.
Paper—"Magnetism." Arthur Harvey.
Report of Committee on Legislation. Villiers Sankey, Chairman.

Evening, 8 o'clock.

ANNUAL DINNER, MCCONKEY'S RESTAURANT.

Thursday, Feb. 26th—Morning, 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Report of Commlttee on Drainage. M. Gaviller, Chairman.
Paper—"Public Works." P. S. Gibson.
Report of Committee on Engineering. E. G. Barrow, Chairman.
Paper—"County Roads." A. W. Campbell.
Report of Committee on Entertainment. A. J. Van Nostrand, Chairman.
Paper—"Water Lots." Geo. Ross.

Afternoon, 2 o'clock.

Nomination of Officers—President, Vice-President, Secretary-Treasurer, Auditors, Two Members of Council.
Unfinished Business.
New Business.
Adjournment.

Minutes of the Eleventh Annual Meeting

OF THE

Association of

ONTARIO LAND SURVEYORS

HELD AT THE REPOSITORY, PARLIAMENT BUILDINGS,

AND AT

THE ENGINEERS' CLUB ROOMS 94 AND 96 KING STREET EAST, TORONTO,

ON FEBRUARY 24TH, 25TH AND 26TH.

AFTERNOON SESSION.

In the Repository, Parliament Buildings, Toronto, on Tuesday, the 24th February, 1903, at 2 o'clock p.m.

In the absence of the President, Mr. W. R. Aylsworth, Mr. C. A. Jones, of Petrolea, Vice-President, took the chair.

Mr. C. A. Jones—Gentlemen,—I am very pleased to call this Eleventh Annual Meeting of our Association to order, although I regret very much indeed that this duty devolves upon me because unfortunately our worthy President, Mr. Aylsworth, is too ill to be present. Our Secretary, Captain Gamble, has received the following telegram from him: "I regret I cannot be with you. Have severe attack of pleurisy. W. R. Aylsworth." I am sorry for the members present, for myself and for the Association, that we lose the able services of such a valued and valuable member of our Association as our President. No one regrets more deeply than I that Mr. Aylsworth is not able to be with us. I have known him a very long time, and he is a man I esteem very highly; and I am sure you all share my regret at the loss sustained by this meeting through his inability to be present.

The first thing on the program is the President's address. Of course we will have to dispense with that for the present. We will take up the second item, the report of the Secretary-Treasurer; and I now call upon Captain Gamble to read his report.

The report of the Secretary-Treasurer was then read.

Mr. Niven moved, seconded by Mr. Dickson, that the Secretary's report be received and handed over to the auditors. Carried.

The Chairman—The next item on the program is a paper by Mr. Henry DeQuincy Sewell, entitled, "Laying Out Town Sites."

Mr. Sewell then read his paper.

Mr. Tyrrell—I move, seconded by Mr. Whitson, that the paper read by Mr. Sewell be received and referred (together with the discussion thereon) to the Publication Committee, to decide what shall be done with it. Carried.

The Chairman—I see the next subject on the program is the report of the Committee on Repository and Biography. Mr. Esten is not here and we shall have to postpone that item until another sitting. As that concludes the program for this afternoon and we have a short time left, possibly it would be to our advantage if Mr. Abrey would kindly explain the advantages of the new level that he has. I am sure it will be extremely interesting to some of us who have not seen it. If Mr. Abrey will be so kind, we will be pleased to see it now.

Mr. Abrey here exhibited and explained to the members present the level referred to.

On motion the meeting adjourned to meet at 8 o'clock p.m.

Evening Session.

Tuesday, 24th February, 1903, at the Repository, Parliament Buildings, 8 o'clock p.m.

Vice-President C. A. Jones (Petrolea), in the chair.

Mr. J. W. Tyrrell here read a paper on "Notes from an Explorer's Diary.

Mr. Tyrrell—Mr. Chairman and Gentlemen,—I do not know whether I should offer an apology for this paper or not. How-

ever, if you do not find any exhibition of profound learning in it you will just have to take it for what it is worth. I had called it "Some Early and Later Experiences of a Surveyor," but after writing the paper I changed the title a little bit.

The Chairman—We are greatly indebted to Mr. Tyrrell for his interesting and valuable paper and for the amount of information that he has given us. I am sure that I myself would not feel like undertaking such a trip as he did. I think a person runs a very great risk in traveling such a distance over such a barren, unexplored waste of land as he has described, without any companion; and I am sure Mr. Tyrrell deserves a very great deal of credit for attempting it.

Mr. Tyrrell—I do not want to be scolded too much about it, because I have been so already at home.

Mr. Dickson—There is a good deal of talk about the vast amount of money Surveyors get; they get from $5 to $10 a day. I would like to know how many of our millionaires or rich men would like to undertake such a trip as Mr. Tyrrell did? How many could undertake it? How many could live through it? I think this is one of the most interesting papers we have ever had as showing the hardships that some of our members have to endure. I do not think that one man in a hundred would have left his men and carried his goods on his back without knowing the country he had to go through, and taking the risk of an accident—a broken leg for instance—when the result would be that he would be heard of no more. This trip might take its place with some of the explorations we have heard lauded all over the world. I do not like to flatter Mr. Tyrrell—I am not a man of flattery—but I feel proud that I am a member of a profession that has got members who would undertake such a feat as this. I have much pleasure in moving a cordial vote of thanks to Mr. Tyrrell for his very interesting paper, and hope the paper will be recorded most accurately in the report of this meeting.

Mr. W. A. Browne—I beg to second that. I re-echo the sentiments expressed by Mr. Dickson.

The Chairman put the motion, moved by Mr. Dickson, seconded by Mr. Browne, that a vote of thanks be tendered to Mr. Tyrrell for his very valuable and interesting paper, and that the same be received and published in the report of the Proceedings. Carried.

Mr. Van Nostrand read the report of the Committee on Publication.

Mr. Tyrrell—Since 1894 there have been extensive amendments to the Ditches and Watercourses Act; in 1897 particularly, I believe. I think it would be very desirable if you could have a complete, up-to-date copy prepared and furnished to the members of the Association.

Mr. Van Nostrand—That is a question well worthy of consideration. I understand the edition of the Ditches and Watercourses Act issued by the Department is out of print; and additions have been made to the Act, so that it is time a new issue should be made. If the Department undertake the work the Association will much appreciate it. Otherwise the Council might look into the matter and get it out in similar form to the Manual if the cost would not be too great. What the Committee had in mind chiefly was the changes that have been made from time to time in the Acts relating to Land Surveyors in particular, and that has very often escaped the notice of members who do not have access to the Annual Statutes. By publishing them in the Annual Reports or Proceedings they can be brought to the notice of Surveyors and transferred to the Manual. It would be quite in order for the Association to go into the matter of publishing the Ditches and Watercourses Act and the Municipal Act, and other Acts of that nature in separate form.

Mr. Tyrrell—That would be a matter outside of the Report?

Mr. Van Nostrand—Yes.

Mr. Dickson—It is very necessary that these amendments and additions should be published and circulated. It is becoming more important every day; every Surveyor, whether he is in active practice or not, should be thoroughly conversant with them. I therefore move that M. Van Nostrand's suggestion be adopted.

Mr. Sewell—I second that motion.

Mr. Van Nostrand—I move the adoption of the report.

Mr. Tyrrell—Would it be in order here to move a resolution in regard to the Ditches and Watercourses Act?

Mr. Van Nostrand—That is Mr. Dickson's motion. I suppose if the Council find it too expensive it needn't be done.

Mr. Dickson—I would suggest that the Council ask the De-

partment to do it, and point out the necessity for it, and if they cannot see their way to do it, then we will do it ourselves.

Mr. Wilkie—Do I understand that the Crown Lands Department got out a copy of the Ditches and Watercourses Act?

Mr. Van Nostrand—Yes.

Mr. Wilkie—I did not see the connection with the Crown Lands Department and the Ditches and Watercourses Act. I understood there was a pocket edition by some man.

Mr. Dickson—It is amended every session.

Mr. Wilkie—It seems to me it would be better to have a separate book. It couldn't very well come in our Proceedings and it had better be in a separate book.

Mr. Tyrrell—You are falling into the error of confusing two matters. The idea is to have a separate pamphlet published.

The Chairman—Of the Surveyors' and of the Ditches and Watercourses Acts separately?

Mr. Van Nostrand—No; the suggestion in the report was that the alterations and amendments to the various Acts contained in our Manual be from time to time printed in our Annual Proceedings in such manner that they can be taken out and transferred to the Manual; and out of that grows the suggestion that the Ditches and Watercourses Act should be printed in the same manner as the Manual, and kept up-to-date in the same way as the Acts published in the Manual.

Mr. Wilkie—I suppose the Department might be got to print something similar to the one Mr. Bowman referred to.

Mr. Bowman—It seems to me it would be better if we got the gentleman who did that to get out another edition.

Mr. Wilkie—He is a lawyer and did that for his own profit.

Mr. Bowman—If he could be persuaded to publish this it would cover the whole matter.

Mr. Wilkie—He sold them at seventy-five cents apiece.

Mr. Bowman—The matter mentioned in the report about examination papers is an important one. I find that students are always anxious to know what they are going to be examined upon; and it is a very good thing to have a set of examination papers published occasionally; I think it increases the value of our Report very much. Do I understand Mr. Van Nostrand that the Committee recommended this to be done this year?

Mr. Van Nostrand—Yes, that was the opinion of the Committee. I think we have three different sets published in the Proceedings up to the present time, and it is time that a fourth set was published.

The Chairman put the motion to receive and adopt the report of the Committee on Publication, and, on a vote having been taken, declared it carried.

The Chairman put the motion, That the Council interview the Legislature with a view to having the different Drainage Acts revised and republished in pamphlet form; and, on a vote having been taken, declared it carried.

Mr. Tyrrell—Is it understood that if we do not secure the publication by the Legislature we will do it ourselves?

Mr. Van Nostrand—Yes; if the expense is not too great.

The Chairman put the motion, That a set of examination papers be published in the report of the Proceedings of 1903; and, on a vote having been taken, declared it carried.

Mr. Bowman—It is a little late, but in connection with this report of the Publication Committee, I would like to ask if we are going to get any more exchanges. I used to value our exchanges very much and I have missed them during the last couple of years.

Mr. Van Nostrand—That is a matter that does not come into the hands of the Publication Committee, because I happen to know they have several Associations that have already sent in their reports for the last year, and they are kept for distribution; you will be inundated with a lot of exchanges from different directions.

Mr. Whitson read the report of the Committee on Polar Research.

Mr. Niven moved, seconded by Mr. Dickson, that the report be adopted and handed to the committee for publication. Carried.

The Chairman—Before we move an adjournment I wish to draw your attention to the fact that the Association will meet to-morrow morning and afternoon at the Engineers' Club, 94 and 96 King St. West; and I would also draw your attention to the fact that we are going to have a Dinner to-morrow evening at McConkey's Restaurant, where I hope to see a good attendance.

Tickets can be had from the Secretary or from the Chairman of the Entertainment Committee, Mr. Van Nostrand. I trust that there will be a good attendance to-morrow, and that you will be punctual.

On motion the meeting adjourned to meet on Wednesday, the 25th February, at 10 o'clock a.m.

Morning Session.

Wednesday, 25th February, 1903, at the Engineers' Club, 94-96 King Street West, Toronto.

The meeting was called to order at 10 o'clock a.m., by the Vice-President, Mr. C. A. Jones.

The Report of the Committee on Land Surveying, with Question Drawer, was first called for.

On motion the report of Mr. Evans was received and ordered to be published in the Proceedings.

On motion the meeting adjourned to meet on Wednesday, the 25th February, at 2 o'clock p.m.

Afternoon Session.

Wednesday, 25th February, 1903, at the Engineers' Club, 94-96 King Street West, Toronto.

The meeting was called to order at 2 o'clock p.m., by the Vice-President, Mr. C. A. Jones.

A paper by Mr. Arthur Harvey, on "Magnetism," was read.

Mr. Harvey—Mr. Chairman, Mr. Van Nostrand asked me to read a paper on magnetism, and I consented at once, because of the very friendly terms on which I have been for a comparatively long time with many members of your profession. After I had made the promise I asked myself if I had done a wise thing: in the first place, I might be carrying coals to Newcastle, and the gentlemen who are in the habit constantly of using the compass should know more about magnetism than I do. However, it so happens that for several years past I have paid a great deal

of attention to the study of this, a matter of great interest to me. I only hope in the few remarks I am going to make that I will interest you as much as I am interested myself.

This paper that I am about to read to you represents original investigations, and I shall submit to you perhaps fifteen or twenty diagrams.

I am in your hands, and sure, at your hands, of a kindly reception; I may say further, if there should be anything in this paper that requires explanation, I hope you will ask questions, and I will answer them if I can. There are only two or three points that may require notice in your transactions.

The Chairman—I am sure you have all listened with very great interest to the very valuable paper by Mr. Harvey, on the preparation of which I am certain he must have spent—may I say, years. I know that you have appreciated it fully, and you are now at liberty to make any remarks, or to ask any questions, as Mr. Harvey suggested at the outset.

Mr. Tyrrell—Mr. Chairman, we have indeed appreciated Mr. Harvey's paper very much, although to many of us, portions of it at least must seem very much like Prof. Galbraith's fourth dimension, inasmuch as we are not able to comprehend the full meaning of everything he has said, not having been educated up to the point to which he has. But certainly the more practical parts of it are of exceptional interest to us, and we can take a good deal of valuable and interesting information from it. One matter to which Mr. Harvey referred, many of us from our earliest experience must have noticed, in connection with compass surveys; that is, the variation of the needle at different hours of the day. I remember that being one of the first things which puzzled me, in my practical work as a Surveyor, in the swamps of Lake Nipissing. Taking an observation in the morning, I found the magnetic variation was different from what it was in the afternoon; and I have to admit that as far as the best of my recollection goes, Mr. Harvey's explanation of that occurrence this afternoon is the first I have ever heard. It has been a part of my work on several occasions to take magnetic variations in connection with my exploratory work, particularly in the vicinity of Hudson Bay, where the magnetic forces are very different from what they are in more southern latitudes. When I first entered Hudson Bay as a member of the expedition sent out under Lieutenant Gordon, in 1885, we were very much troubled

during foggy weather on account of the sluggishness of our marine compasses; indeed, it was necessary for us to keep the lead going all the time, as the ship's compass was considered quite unreliable. We were then about the southern end of Fox Channel, near the west end of Hudson Bay. There particularly the horizontal force appeared to be so insignificant as to make the compass useless, and we had to travel by the sun or points on the land which we could recognize on the shore.

Then again, in my later work, in the vicinity of Chesterfield Inlet, we found the same trouble. I was obliged there to work with the solar compass entirely, rather than with the magnetic compass.

I have great pleasure indeed in moving a hearty vote of thanks to Mr. Harvey for his very learned and interesting paper.

Mr. P. S. Gibson—I beg to second the vote of thanks to Mr. Harvey, and I must express my pleasure, and, I might say, surprise, too, that one of our citizens of Toronto should take such a deep interest in a matter of this kind when not professionally employed. Generally, even in laying out town lots, people think that the work should be in accordance with the salary.

Why is it that in the cycles of time Providence seems to raise up individuals, like Newton and our friend Harvey and other scientists, to develop ideas that many of us have not time to indulge in? I have noted his appearance year by year before the Astronomical Society, and the papers he has read, and have wished that I had time to thoroughly read them. The surveying business requires the expenditure of a great deal of energy; but sometime I hope to be able to catch up in my reading, if not in this world, perhaps in the next.

I remember when I was a boy an old Surveyor pointed out to me that any fool could run a line with a transit, but it took a pretty clever man to run a line with a compass; and I enquired of him how it was that the old Surveyors seemed to have such a faculty in that way. "Well," said he, "young man, the first thing you have to do is to set your compass in your office, if you have one, or in your camp if you have not an office, and watch it every day, according to the weather and according to the sunlight, in misty or cloudy weather, or whatever it may be; study your compass from about 8 o'clock until two in the afternoon, and then sit up every night and watch it come back again." Many of the old Surveyors had a means of laying off this varia-

tion. I remember hearing a Surveyor complain that he was running loops or scallops in his work. His compass was varying and he had no means of correcting it.

A Surveyor might in doing work put down the time of day when it was done and put down the day of the month and the period of the moon. I remember one year that I was doing work on an old survey. I had re-run the line. I found an old fence line which was proved to have existed for many years. After making the proper allowances I had no difficulty in locating the old stone monuments. It is said that the compass is never right, but it is never very far wrong in the hands of a good Surveyor. I was wondering if our friend Mr. Harvey would have made a good Surveyor. I am sure he would have been a bad hand in making up the cash, because he would have been too careful.

I suppose Mr. Harvey's paper will appear in our transactions so that we may refer to it, and I have very much pleasure in seconding the resolution.

The Chairman—Gentlemen, you have heard the motion moved by Mr. Tyrrell, seconded by Mr. Peter Gibson, that the paper as read by Mr. Harvey be received and adopted and that a hearty vote of thanks be tendered to him for his labors and patience in preparing this paper for us. Carried, with applause.

The Chairman—We will now take up the next subject on the program, a paper by Mr. Peter S. Gibson, on "Public Works."

Mr. Peter S. Gibson—The subject that I have chosen to speak on is "Public Works in the Township of York." It is coming down from the celestial to the terrestrial, still it is a matter of business with us Surveyors. It is not possible for us all to attain to our friend Mr. Harvey's eminence, but it is quite possible for us all to come down to what I have to say.

The paper was here read by Mr. Gibson.

Mr. Fawcett—Mr. Chairman, this address by Mr. Gibson has been very practical and interesting to the members of the profession generally. I move its adoption, and I would also like that the forms should be published, as they would be very useful as examples to be followed in other townships.

Mr. Sewell—I second Mr. Fawcett's motion.

Mr. Dickson—Mr. Gibson's paper was, as his papers always are strictly practical. In his papers there is nothing but what is practical, and we can always follow his suggestions. I am very glad to hear such an interesting and instructive paper. When

I heard that Mr. Gibson was to give us a paper I knew it would be interesting, and I am glad to hear that the members desire all its details to be published in our Minutes.

The Chairman, having put the resolution to the meeting, declared it carried.

The Chairman then announced the dinner to take place in the evening and stated that the Association would meet in the morning in the Repository, in the Parliament Buildings, at 10 o'clock, as there was still a good deal of business to be transacted.

It was moved by Mr. Sewell, seconded by Mr. Wilkie, that the meeting adjourn until dinner in the evening. Carried.

Morning Session.

Thursday, 26th February, 1903, at the Repository, Parliament Buildings, Toronto.

The meeting was called to order at 10 o'clock a.m., by the Vice-President, Mr. C. A. Jones.

The Chairman—We will open the session with the reading of a paper on "Water Lot Surveys and Plans," by Mr. George Ross. Mr. Ross is not here, but Mr. Wilkie will read the paper for him.

Mr. Wilkie read paper on "Water Lot Surveys and Plans."

Mr. Sankey—I have much pleasure in moving that this paper be accepted and printed in the Report of the Association.

Mr. Fawcett—I take much pleasure in seconding that.

The report of the Council was now laid before the Association.

Major Sankey—The only business before the Council was the appointment of Mr. Niven to replace Mr. Jones. No new by-laws were passed and no old members have asked to be put on the list of members without paying dues.

The report of the Board of Examiners was then read.

Mr. Dickson—I move that the report of the Council and the Board of Examiners be received and adopted.

Mr. Evans—I have much pleasure in seconding that. Carried.

Mr. Whitson here read the statement of the Auditors, from the 25th February, 1900, to the 30th of November, 1902, and from the 1st December, 1902, to the 23rd February, 1903, and stated that the Auditors had examined all the vouchers and receipts and accounts and found them correct in every particular.

Mr. Wilkie moved that the report as read be received and adopted.

Mr. Dickson—I think the report is very satisfactory. We are flourishing and have a nice little sum on hand. I have much pleasure in seconding the motion. Carried.

The Chairman asked Major Sankey for the report of the Committee on Legislation.

Major Sankey—Mr. Chairman, I have no written report prepared, for the simple reason that the Committee on Legislation had no reason to meet; nothing came either before the Council or the Committee which would require us to take any action. As you are all aware, the Engineers' Bill, for which this Committee particularly was appointed, fell through.

No new matter has come before the Committee that the Association desired to bring before the Government. Should any member of the Association think a change in the Act is necessary the Committee will be glad to take it up, but nothing of that kind has come before us during the past year.

Captain Gamble here read the report of the Drainage Committee.

The Chairman—This is a subject on which there is room for lots of discussion by those who are interested in the work. The suggestion that is made of reporting to the Secretary, is one that I had in my mind. I did not know that it was in the report, and I was going to suggest it. There are Engineers who find great difficulty in the present working of the Act, and we would be glad if they would suggest what change they might think necessary and forward it to the Secretary and have it considered by the Drainage Committee or possibly by the Association at its meetings.

Mr. Evans—I have much pleasure in moving the reception of the report, and that it be published in the Proceedings.

Mr. Fawcett—I second that motion. Carried.

Mr. Van Nostrand—Mr. Chairman and gentlemen, the Entertainment Committee has not yet completed its labors and the

report is in an unfinished state; so I would ask that the old practice be followed, of taking it as read and having it printed in the Proceedings. I will move that this be done.

Mr. Sewell—I will second that motion. Carried.

On motion, the meeting adjourned to 2 o'clock p.m.

Afternoon Session.

Thursday, 26th February, at the Repository, Parliament Buildings, Toronto.

The meeting was called to order at 2 o'clock p.m., by the Vice-President, Mr. C. A. Jones.

Paper on "County Roads," by Mr. Campbell.

Mr. Tyrrell moved that Mr. Campbell's paper be taken as read and printed in the report.

Mr. P. S. Gibson—I have much pleasure in seconding that motion. We have heard Mr. Campbell many times; he is a brilliant orator and he has done good work in the township. His paper is a first-class one, and we will take it as read.

Mr. Dickson—We may accept it as read.

The Chairman put the motion, that Mr. Campbell's paper be taken as read and published in the proceedings of the meeting. Carried.

Mr. Speight here read the report of the Committee on Exploration.

Mr. Kirkpatrick moved that the report be accepted and printed in the Report.

Mr. Fawcett—I second that motion. Carried.

The report of the Committee on Engineering was read by Mr. Gibson.

Mr. Niven moved that the report be adopted and published.

Mr. Kirkpatrick—There is a great deal of truth in what that report states about Ontario Land Surveyors having risen to eminence in the profession of engineering, they having first been Land Surveyors. The first day of this meeting I had the pleasure of receiving a visit from the Chief Engineer of the Grand Trunk Railway, Mr. Hobson. He was very sorry he could not remain

and pay the Association a visit; he was just passing through. He has been for many years Chief Engineer of the Grand Trunk Railway; he was an Ontario Land Surveyor when I came to this country; he was a very exact man. Mr. Peterson, Chief Engineer, C.P.R., and Mr. Mountain, the Chief Engineer of the Canada Atlantic, are also Ontario Land Surveyors. It rests pretty well with the Ontario Land Surveyors themselves to get a knowledge of their profession and then rise to the top. I would like to add one more name, that of Sir Sanford Fleming, who is also a Land Surveyor; I had the pleasure of being examined by him. There is also Mr. H. D. Lumsden, who has also risen to eminence as a railroad Engineer and who is also a Land Surveyor. In addition to those I have mentioned as specially deserving position, I may mention Mr. Otto J. Klotz, another member of this Association, who has just been appointed by an order-in-council of the Astronomers, to determine the longitude along the line of the Pacific Cable for the completion of the astronomic current of the world—an achievement for Canada to be proud of.

Mr. Gibson—Some years ago a great number of Engineers of railway companies desired to pass the examination for Land Surveyors, wishing after a short course spent, to get through the Board so as to be able to put P.L.S. after their names, but when they came up for examination they did not care to go on.

Major Sankey—Many of the rising generation who have been to McGill College or to the Royal Military College at Kingston, the School of Practical Science, Toronto, or the School of Mines at Kingston, come up for our examinations and obtain their certificates as O. L. Surveyors.

Mr. Dickson moved, seconded by Mr. Niven, that the report be adopted as read, and printed in the Proceedings of the meeting. Carried.

Mr. Kirkpatrick moved, seconded by Major Sankey, that this Association exceedingly regrets the absence of the President, Mr. W. R. Aylsworth, because of illness, and that the President's address be taken as read, and printed in the forthcoming Proceedings. Carried.

Moved by Mr. Speight, seconded by Mr. Sewell, that Mr. H. J. Brown and Mr. J. F. Whitson be granted the sum of $10 each for their services in auditing the accounts for the last three years. Carried.

Moved by Mr. Niven, seconded by Mr. Gibson, that the Secretary-Treasurer be granted the sum of $225 for his services during the past year. Carried.

Moved by Mr Van Nostrand, seconded by Mr Sewell, that Mr. Whitson's paper, "Extracts from the Original Diaries of David Thompson, Astronomer Royal, on the Survey of the International Boundary," be taken as read and printed in the Proceedings. Carried.

Moved by Mr. Niven, seconded by Mr. Whitson, that the paper on "Irrigation" by Mr. Saunders be taken as read, and printed in the Proceedings. Carried.

Mr. Whitson moved, seconded by Mr. Sewell, that the report of the Committee on Repository and Biography be taken as read, and printed. Carried.

Mr. Van Nostrand moved, seconded by Mr. Fawcett, that the report of the Topographical Survey Committee be taken as read, and printed. Carried.

On motion the meeting took a recess.

After recess.

The Chairman—I am prepared to receive nominations for officers for the ensuing term.

Mr. Dickson—When we first formed the Association it was customary to re-elect the gentleman who had been President for one year for the succeeding year also, so that he would hold the chair during two years. Later that was changed and the presidential term was made a one-year term, and then it became an unwritten law that the Vice-President should be the next President; but in the present year I think we should re-elect our President. Our President during the past year is one of the oldest Surveyors in the Province and is one of the oldest members of the Association; he is a useful member both as an individual and as a Surveyor, and he has taken a prominent part in our meetings. I would therefore move that Mr. Aylsworth, in view of the fact that he is not able to be present at this meeting because of sickness, be re-elcted President.

Mr. Kirkpatrick—I have much pleasure in seconding this. As you all know, Mr. Aylsworth is suffering from severe illness. He is a very valuable member of the Association and I think it would be but right for the Association to depart in this instance from its usual custom.

Mr. C. A. Jones—I am very pleased indeed that this divergence from the general rule has been proposed, and that it is proposed to re-elect our President for a second term. I have very much pleasure as Chairman of this meeting in putting the motion that Mr. Aylsworth be re-elected for the ensuing year. Carried unanimously.

Mr. Dickson—I move, seconded by Mr. Kirkpatrick, that Mr. C. A. Jones of Petrolea be re-elected Vice-President for the ensuing year.

Mr. Dickson put the motion, and, on a vote having been taken, declared it carried unanimously.

Mr. C. A. Jones—I thank you very much indeed for re-electing me Vice-President, although I do not feel myself worthy of the office in an Association where there are so many others of greater ability who are more worthy than I am, and who could fill the position much better than I do, and I think with greater acceptance to the members. I cannot let the opportunity pass without thanking you most sincerely for the honor that you have conferred upon me in this re-election.

The Chairman—I will now call for nominations for the office of Secretary-Treasurer.

Mr. Niven moved, seconded by Mr. Sewell, that Captain Gamble be re-elected Secretary and Treasurer. Carried unanimously.

Captain Gamble—I have to thank you very much a second time for the trust you have reposed in me. During the past year, I have felt, as I said in my report, that there have been many apparent failures, but I trust now that I have been regularly inducted into office, that at the end of next year, if I am spared so long, the affairs of the Association will be in a more satisfactory condition.

The Chairman—The next election is that of Auditors. The previous Auditors were Messrs. H. J. Browne and J. F. Whitson.

Mr. Sewell moved, seconded by Mr. Niven, that Mr. J. F. Whitson and Mr. W. A. McLean be Auditors. Carried unanimously.

The Chairman—The two members who are retiring from the Council this year are Messrs. Alexander Niven and A. J. Van Nostrand. They are open for re-election.

Mr. Whitson—I move that Mr. A. J. Van Nostrand be re-elected to the Council.

Mr. Van Nostrand—I move that Mr. J. A. Robertson, of Glencoe, be elected to the Council.

Mr. Kirkpatrick—I nominate Mr. Niven.

Mr. Speight—I nominate Mr. Thomas Fawcett, of Niagara Falls.

Captain Gamble—I nominate Mr. Thomas Speight.

Mr. Speight—I will ask to have my name withdrawn. I will nominate Mr. George E. Silvester, of Sudbury.

Mr. Dickson—I nominate Mr. Wilkie.

Mr. Gibson—I nominate Mr . Sewell.

Major Sankey—I nominate Mr. W. G. McGeorge, of Chatham, for the Council.

The Chairman declared the nominations closed.

The Chairman appointed Mr. R. B. Fairbairn and Mr. Henry Smith as scrutineers.

Mr. Kirkpatrick moved that Mr. Jones leave the chair and that Major Sankey take it.

Mr. Jones here retired from the chair, which was taken by Major Sankey.

Mr. Kirkpatrick—I move that a cordial vote of thanks be given Mr. Jones for presiding over our deliberations at this Annual Meeting. I am sure I am only voicing the opinion of all present when I say that his courtesy and kindness and his manner of conducting the meeting has conduced very much to the happy results that we have had in this meeting, and it has been a very successful one, I think.

Mr. Dickson—I second the motion.

Major Sankey, the acting Chairman, put the motion, which was carried unanimously, with applause.

Major Sankey (Acting Chairman)—Mr. Jones, I have very much pleasure in conveying to you the cordial vote of thanks of this meeting for your very able conduct in the chair. I am sure the Association feels deeply indebted to you for the manner in which you have conducted the business in the absence of the President.

Mr. Jones—I feel deeply grateful to you, I can truthfully say, for this expression of your feelings in tendering me this vote

of thanks for the slight services that I have rendered during the past few days, in acting as Chairman of the meetings of the Association. I feel that you have acted very kindly towards me in making my position so easy. Considering that I have never presided at anything of the kind before, I felt rather a novice in the chair. You have been very lenient towards me, so that my task has not been a difficult one. I very much regret that I had to act as President, as I should have very much preferred seeing Mr. Aylsworth here in the chair. I sincerely hope he will be with us next year. Once more thanking you for your kindly expressions towards me, and hoping to meet you all here a year from now, and to see our President, Mr. Aylsworth, in the chair, I will take my seat. (Applause.)

Moved by Mr. Tyrrell, seconded by Mr. Wilkie, that any errors or omissions in the report of the Proceedings of this meeting now in the hands of the Secretary and stenographer, be corrected by them before being printed in the Proceedings. Carried.

On motion the meeting adjourned.

MEMBERS IN ATTENDANCE AT THE ELEVENTH ANNUAL MEETING, FEBRUARY 24th, 25th and 26th, 1903.

Abrey, G. B.
Barrow, E. G.
Blair, W. J.
Bowman, Herbert
Bray, Edgar
Browne, W. A.
Craig, S. E.
Davis, John
Dickson, James
Dixon, Howard
Evans, J. D.
Fairbairn, R. J.
Fawcett, Thos.
Gamble, Killaly
Gibson, Peter S.
Gibson, W. S.
Holcroft, H. S.
James, Silas
Jones, C. A.
Jones, J. H.
Kirkpatrick, G. B.
McLean, W.
MacKay, J. J.
Mountain, G. A.
Niven, A.
Sankey, V.
Shaw, J. H.
Smith, D. A.
Speight, T. B.
Sewell, H. de Q.
Stewart, Elihu
Stewart, Louis B.
Tyrrell, J. W.
Van Nostrand, A. J.
Walker, A. P.
Whitson, J. F.
Wilkie,E. J.

Reports.

REPORT OF SECRETARY-TREASURER.

Mr. Chairman,—I have the honor to submit my report of the official business of the Association transacted by me between 20th March, 1902, and 23rd February, 1903. In the early months of the year I was occupied in revising the Minutes of our meeting, and preparing, in conjunction with Mr. A. J. Van Nostrand, Chairman of Publication Committee, the papers for publication, and by the first of August everything was ready for the issuing of the Report, with the exception of the late Secretary's financial statement.

I regret very much the unfortunate delay there has been in publishing and circulating the Report, but as the matter was brought to the notice of the Council, they are acquainted with the circumstances which caused the delay.

During the year four new members have been added to our list.

The work of the Standing Committees deserves the special attention of the members, the duties connected with them being much more arduous than is generally supposed; and the Land Surveying Committee is particularly useful in bringing before the Association many questions, the solution of which seemed difficult to individual members.

The financial statement herewith submitted by me covers only the period from 1st December, 1902 to 23rd February, 1903. Owing to circumstances known to the Council of Management, no financial transactions passed through my hands prior to that date.

By arrangement of the Association at its Annual Meeting in 1902, the accounts for the two preceding years were to be audited and presented to the Council at its meeting in April. Delays arose, and the period was extended to 1st December. The financial statement preceding mine has been duly audited, and covers the period between 28th February, 1900, and 30th November, 1902, thus connecting the statement published in the Proceedings for 1901 with my own.

In presenting my first Report as Secretary of this Association I have great pleasure in thanking the members for their courtesy and forbearance towards me, in spite of the many apparent failures that have been manifested during my year of office.

Respectfully submitted,

KILLALY GAMBLE,
Secretary.

STATEMENT OF BALANCES, RECEIPTS AND EXPENDITURES BETWEEN FEBRUARY 28, 1900, AND NOVEMBER 30, 1902.

Dr.

To Balance in Bank 27th February, 1900		$2,039 15
" Receipts from advertisements		68 50
" " Board of Examiners		759 75
" Interest on Savings deposit		96 70
" Receipts from Fees, Dues and Registration		1,186 00
		$4,150 10

Cr.

By Amount for publishing Proceedings of 1900 Meeting	$370 92	
" " Manual 1900	180 00	
" granted Secretary-Treasurer, 1900	200 00	
" " to Auditors	1000	
" " to Canadian Patriotic Fund	100 00	
" paid for expenses, Council Meetings	29 30	
" " Secretary's bond	7 50	
" " reporting Annual Meeting	30 00	
" " Printing and Stationery	70 60	
" " Postage, Circulars, etc	85 00	
" " Cartage, Express, etc	15 50	
" " Brokerage, Commission, etc	17 25	
		$1116 07

1901 AND 1902.

By Amount paid for publishing Proceedings of 1901 and 1902 Meetings	$622 88	
" granted Secretary-Treasurer, 1901-1902	450 00	
" paid for reporting Annual Meeting, 1901	40 00	

By Amount paid for	Address to H. M. The King	10 00	
" "	Rent of Club Room	10 00	
" "	Expenses of Council Meetings	47 75	
" "	Law Expenses (1900-1-2)	53 25	
" "	Printing and Stationery	29 00	
" "	Cartage and Brokerage	10 55	
" "	Secretary's Bond	15 00	
" "	Postage and Sundries	60 00	
" "	extra copies Exchange Reports	25 00	
			1,373 43
By Amount of disbursements in Board of Examiners Acct.			395 60
By Balance on hand in Bank			1,265 00
			$4,150 10

Toronto, November 30, 1902.

VILLIERS SANKEY, *Sec.-Treas.*

BALANCE SHEET OF BUSINESS BETWEEN DECEMBER 1, 1902, AND FEBRUARY 25, 1903.

Dr.

To Balance on hand in Savings Account, Dec. 1, 1902		$599 75	
" " "	Current Account, Dec. 1, 1902	665 25	
" Receipts in Board of Examiners Account, including Government Grant of $200		375 00	
" Dues and Registration Fees		72 00	
" Manuals sold		1 50	
			$1,713 50

Cr.

By Amount of disbursements in Board of Examiners Acct.		$269 20	
" paid for Reporting Annual Meeting, 1902		41 85	
" "	Postage	17 50	
" "	Expenses of Members of Council	11 25	
" "	Freight on Books	1 07	
" "	Furniture for Repository	5 60	
" paid to Caretaker		2 00	
" paid for Office Sundries		50	

By Balance on hand in Savings Account	599 75	
" " Current Account	655 25	
By Cash in hand	99 53	
		$1,713 50

Toronto, February 25, 1903.

KILLALY GAMBLE, *Sec.-Treas.*

We hereby certify that we have examined the accounts of the Secretary, Treasurer and the vouchers therefor, also financial statement and bank accounts and have found them correct.

Respectfully submitted.

H. J. BROWNE
J. F. WHITSON } *Auditors.*

Toronto, February 25, 1903.

REPORT OF THE COUNCIL.

The only business before the Council was the appointment of Mr. Niven to replace Mr. Jones as a member of Council. No new by-laws were passed and no old members have asked to be put on the list of members without paying dues. The report of the Board of Examiners is forwarded herewith.

Respectfully submitted,

VILLIERS SANKEY.
Chairman.

REPORT OF COMMITTEE ON PUBLICATION.

MR. PRESIDENT,—Your Committee on Publication have this year little to report but the usual routine of work.

The matter placed in our hands for publication was arranged as speedily as circumstances would permit, and the Proceedings for 1902 has been in its present condition ever since August last.

Delay in some of the inserts was encountered, and the Secretary-Treasurer, by the request of the Committee, held the issue until last week.

Your Committee would ask the opinion of the Association as to the advisability of publishing a set of examination papers in the forthcoming Proceedings. The demand for such papers seems to increase, and there appears to be no valid reason why the demand should not be considered. Perhaps some members of the Association can suggest objections to the annual publication of such papers. While this is a matter that seems to come within the scope of the Council's direction, the question usually falls to the lot of the Committee to decide, hence the request for advice.

It has also been suggested that the new Statutes annually enacted by the Legislature be searched for items of interest to our profession and excerpts therefrom published as addenda to the Proceedings, so that those desirous of keeping their manuals up to date may do so by transferring the necessary pages. It may be noted that the Proceedings of 1901 contained matter of that kind and it has been found very useful.

All of which is respectfully submitted,

A. J. VAN NOSTRAND,
Chairman.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

Your Committee on Repository and Biography beg leave to report as follows: The rooms have been throughout the last year used for the purposes intended, namely, the meeting of the Board of Examiners, the meetings of the Council of Management and Standing Committees, and as drafting rooms for the members copying plans and records in the Department of Crown Lands.

No additions have been made to the collection of autobiographies and photographs, which is still far from complete, during the past year. The Committee would again tender a reminder to the members of the Association who have hitherto neglected this matter.

All of which is respectfully submitted,

H. L. ESTEN.
Chairman.

REPORT OF COMMITTEE ON EXPLORATION.

MR., PRESIDENT,—Your Committee on Exploration for the Association year 1902-3 has little to add to the data supplied by the very able and comprehensive paper prepared by the Director of Surveys and published in the Proceedings of the Association for 1902.

The exploration work of the ten parties sent out in 1900, as described in the paper referred to, was necessarily of a somewhat cursory nature, and in the territory allotted to each there was doubtless a considerable proportion which could not be covered. It is therefore a fair inference that to the assets of the Province discovered and reported by the Surveyors employed upon that expedition, much should be added for the unexplored parts of their several fields.

In the opinion of your Committee there still remains a vast expanse of territory practically unknown except along the main waterways.

The examination of the interior—between these waterways—would be a much more difficult and expensive undertaking than that attempted by the general plan of 1900, and would involve a complete scheme of permanent survey lines to subsequently serve as outlines of timber berths and townships. This method, which has for years been advocated by the head of the Surveys Branch, has commended itself to the Clergue interests at the "Soo," who are about to make their selection of railway lands

from township outlines run during the past two years, having at the same time made a more or less thorough examination of the timber and mineral resources of these lands while the surveys were being made—timber estimators and geologists accompanying the surveying parties on similar lines to those carried on by the Government in 1900.

All of which is respectfully submitted,

T. B. SPEIGHT,
Chairman.

REPORT OF COMMITTEE ON POLAR RESEARCH.

MR. PRESIDENT,—Your Committee finds itself obliged to report the object of its existence as yet unaccomplished, namely, the discovery of our extreme north boundary post.

But we as Canadians have reason to be proud of our fellow-countryman, Captain E. J. Bernier, who, in the untiring perseverance and energy which he has displayed for several years past, and is still exerting, has thus proved himself to be the right stamp of man for the work which he has cut out for himself. Indeed, your Committee would consider the actual discovery of the Pole a picnic as compared with the efforts already exerted by Captain Bernier in endeavoring to work up the necessary interest in his grand project to enable him to finance a Canadian Polar Expedition.

Within the past month one member of your Committee has received several letters from a New York millionaire with a view to securing him as a member of a 1903 American Polar Expedition. He does not expect to accept such a position, but why can we not find some such Canadian interest willing to stand behind our Canadian expedition?

Your Committee wishes once more to place on record its entire confidence in Captain Bernier's plan of operation, and sincerely hopes that the Government of Canada and the various Provinces may contribute sufficiently to enable the Canadian Polar Expedition to become thoroughly well equipped, and ultimately to be a crowning success.

It is also the opinion of your Committee that some steps should be taken by our Government to define authoritatively our northern boundary. The islands lying to the north of the American continent may be valueless or they may be invaluable, and at present they are nominally a part of Canada; but so much activity is being shown by our neighbors to the south in the

prosecution of Arctic exploration that important discoveries of economic value may be made there at any time, and Canada should not wait until then to state clearly our claims in that region.

WILLIS CHIPMAN,
Chairman.

REPORT OF EXAMINERS, 1902-3.

The following is the Report of the Board of Examiners:

The Board met at the Board Room, Crown Lands Department, Feb. 10th, 1902.

The following candidates passed the required examinations.

FINAL.

Stanley, H. Filmore, St. Thomas, Ont.
Lennox T. Bray, Amherstburg, Ont.
Herbert Spencer Holcroft, Toronto, Ont.
Edward Hamilton Low, Port Dover, Ont.

PRELIMINARY.

David Layton Steele, Meaford, Ont.
William Waddell, Hamilton, Ont.

The bonds of the following Land Surveyors were approved and filed in accordance with the provisions of the Act.

Lennox T. Bray.
Stanley H. Filmore.
Herbert Spencer Holcroft.
E. H. Low.

The following articles were filed by the under-named pupils.

NAME OF PUPIL	NAME OF SURVEYOR	RESIDENCE	DATE OF ARTICLES	TERMS
Adams, Chas. F....	Jones, T. H.....	Brantford	February 28, 1901	Three ye'rs
Clark, Chas. B.....	Moore & Henry....	London	" 16, 1901	"
Greenlees, A. H....	Moore & Henry....	London	" 16, 1901	"
Code, R. S.....	Code, A. S.....	Alvinston.....	" 19, 1901	"
Brian, M. A.....	Newman, W.....	Windsor	" 18, 1901	"
Barrett, R. H.....	Morris, J. L.....	Pembroke	May 26, 1901	One year
Waddell, W. H....	Ford, W. B.....	Hamilton.....	March, 1902	Three ye'rs
Steele, D. L.....	Sing, ——	Owen Sound..	March, 1902	One year
Blair, W. J.....	Bowman, H. J.....	Berlin.....	June 2, 1902	"
Bigger, S. H.....	Bigger, C. A.....	Ottawa.....	April 29, 1902....	"

The Board met at the Board Room, Parliament Buildings, Feb. 9th, 1903.

The following candidates passed the required examinations:

FINAL.

Anderson, W. B., Ottawa, Ont.
Barrett, R. H., Pembroke, Ont.
Bigger, S. H., Ottawa, Ont.
Clark, L. O., London, Ont.
Dixon, H., Smiths Falls, Ont.

PRELIMINARY.

Bingham, E. R., Toronto, Ont.
McCaw, R. D., Welland, Ont.
Smith, W., Woodville, Ont.

Mr. Bigger's apprenticeship will not expire until April 29th; he must file the necessary certificate and present himself to be sworn in after that date in accordance with the resolution of Council passed Feb. 14th, 1902.

The following articles were filed by the under-named pupils.

NAME OF PUPIL	NAME OF SURVEYOR	RESIDENCE	DATE OF ARTICLES	TERMS
Coyne, J. G. B.....	Bell, James A.....	St. Thomas...	Dec. 17, 1902	One year
McCaw, R. D.	Ross, G.	Welland.....	Feb. 14, 1903 ...	Three ye'rs

The following bonds have been approved and filed.
L. O. Clarke.
Howard Dixon.

Respectfully submitted,

VILLIERS SANKEY.

REPORT OF ENGINEERING COMMITTEE.

Mr. President,—Your Engineering Committee, in submitting the following report, have departed somewhat from the usual plan of commenting on those branches of engineering which have engaged the attention of Surveyors or with which they have been intimately connected, and have presented a report dwelling on the advantages of a Surveyor's training as a foundation for engineering success, and also pointing out from personal experience the advantages and disadvantages in the life of a salaried engineer as compared with that of one in private practice.

The report has been made as brief as possible so that the various members present may give their views on the subject. There is no question that the training a Surveyor gets in the field tends to make him physically strong and hardy, and the mathematical studies he has to undergo during his pupilage, together with the problems in disputed boundaries, etc., which are constantly presented to him, produce an exactness of thought, which prepare him to arrive at correct solutions of the various enginering problems which come before him as an engineer.

It will be conceded, therefore, that the education and training of an Ontario Land Surveyor are peculiarly adapted to promote his success as an engineer. We find that generally speaking engineers, so far as income is concerned, may be divided into two classes, those receiving salary, and those engaged in private practice. Which class earns most money it would be difficult or impossible to say. The practising Surveyor has also a limited engineering practice, and he has one great advantage over his salaried brother, and that is, to use a somewhat slang expression, "he is his own boss." This to some natures is almost their life, and many men would rather earn less income and be independent in this way. There is one factor in a practising Surveyor's life which is perhaps peculiar to the profession, and that is, an old Surveyor, if he has lived long in the one place, from his local knowledge is in more request than a younger one (provided of course that he is intellectually equal to the young one), so that age, which is such a drawback in many callings, is a positive advantage at times to the Surveyor.

A successful practising engineer should also be a good municipal lawyer, thoroughly acquainted with the Local Improvement, Drainage and other municipal Acts. The salaried engineer, whether he be a municipal or railway engineer, has a steadier income, and if he has been long employed in that way finds it difficult to resort to the life of a general practitioner. We trust that what has been written may direct the attention of the members of this Association to the fact that their education and training as Land Surveyors especially fits them for an engineering career, and this is instanced by the number of important engineering positions held by Land Surveyors.

All of which is respectfully submitted,

ERNEST G. BARROW,

Chairman.

REPORT OF COMMITTEE ON LAND SURVEYING.

MR. PRESIDENT,—This Committee begs leave to report that to the best of its information there is nothing of serious import to mention.

One question only was submitted to the Committee under the "Question Drawer" to answer, viz: by Mr. S. James, regarding a case, or cases, often occurring in the Northwest Territories, to which we consider it unwise to give an explicit reply.

The following questions were brought before the full meeting of members, viz., Mr. Shaw submitted a case occurring in the section of a 1,000 acre block, where it was agreed that the old posts should govern.

Mr. Jones, V.P., submitted a case where the block covered was not surveyed in the original survey, but a subsequent survey made apparently without instructions from the Department was endorsed by the same and a patent granted. Held by majority that this original survey should govern.

J. D. EVANS,

Chairman.

REPORT OF COMMITTEE ON DRAINAGE.

GENTLEMEN,—A report on the drainage situation for the past year would be but, in most part, a repetition of the statements made in the excellent report of the Chairman of Drainage Committee in the Ontario Land Surveyors' Annual for 1901. By reading this report and the discussion on drainage in the Annual for 1902, a very fair idea can be formed as to changes in procedure and definitions considered necessary by those employed in drainage work. While much has been stated as requiring change, very little has been suggested as to a better method. As such diverse opinions exist upon the subject, and the time most limited that any Drainage Committee could obtain to meet and discuss proposed amendments, I think the Association is to be congratulated upon the formation of the Committee on Legislation to assist in such matters.

I would suggest that all those who wish to have their ideas on the subject considered, should send them in writing to the Secretary of the Association, he being a permanent official, and known to all the membership. That the Secretary hand such communications over to the Chairman of the Committee on Drainage or Legislation for the current year, whichever may be considered most advisable, and that all such communications be kept on file for future reference. This method would give a better opportunity to compile the information, and adopt for presentation to the Association, those suggestions considered most suitable.

With pleasure we announce that the Ditches and Watercourses Act has been so amended as to remove the objections to Section 28.

All of which is respectfully submitted,

M. GAVILLER,
Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

Mr. President,—Your Committee on Entertainment beg leave to submit the following report of their work for the current Association year.

Upon the advice of the Council and the Board of Examiners it was arranged that the meeting of the Association should be held on alternate days in the rooms of the Association and the quarters of the Engineers' Club respectively.

The superior advantages of the latter place are too obvious to require mention, and the fraternal spirit which prompts the Engineers to grant us the use of their rooms, library, etc., is duly appreciated. At the same time the business part of the Association meeting can be more successfully carried on when within reach of our own records and books of reference.

The Annual Dinner, held at McConkey's, was, as usual, an important incident of the meeting of 1903, and its manifest success was in a great measure due to the interest and attention given it by the Secretary-Treasurer, Captain Gamble, as well as to his generosity.

The following members attended, viz., Mr. Geo. B. Kirkpatrick, Chairman of the evening; Mr. C. A. Jones, Vice-Chairman; Messrs. A. Niven, James Dickson, Thomas Fawcett, John Galbraith, J. W. Tyrrell, G. A. Mountain, Willis Chipman, S. Harry Jones, T. B. Speight, J. F. Whitson, Killaly Gamble, H. L. Esten, H. DeQ. Sewell, W. A. MacLean, E. T. Wilkie, Howard Dixon, C. H. Pinhey, and A. J. Van Nostrand.

The guests present were, Mr. Aubrey White, Assistant Commissioner of Crown Lands; Mr. Kivas Tully, Consulting Architect for Ontario Public Works Department; Dr. Coleman, President of the Canadian Institute; Mr. Thomas Southworth, Clerk of Forestry and Superintendent of Colonization for Ontario; E. A. Jones, representing the Engineering Society of the School of Practical Science; and Messrs. R. E. Speakman, R. A. Gray, C. E. Fleming, and E. Newton May.

Among the invited guests who were unable to be present were the following: The Commissioner of Crown Lands, the President of the Canadian Society of Civil Engineers, the Director of the Bureau of Mines (Ontario), the President of the

Engineers' Club, the City Engineer, Lt.-Col. Delamere, Messrs. Arthur Harvey and Angus MacMurchy.

The output of "mine hosts'" larder having received due appreciation, toasts, speeches, songs and recitations filled the remainder of the evening in a very agreeable manner.

The Chairman proposed the health of the King, a hearty response being given in the form of "God Save the King." "Our Dominion," was met by "The Maple Leaf," and responded to by Messrs. G. A. Mountain, Thomas Fawcett and J. W. Tyrrell. A song, "For the King," by Mr. Donald C. MacGregor, was the next item on the program. The toast of "Our Province," was responded to by Messrs. Kivas Tully, Aubrey White and Thomas Southworth. Mr. R. A. L. Grey then sang "The Boys of the Old Brigade." In reply to the toast "Our Militia," coupled with the names of Major T. Harry Jones and Sergeant May, the former delivered one of his best recitations, "Phoderick Cahore." The toast "Our Sister Institutions," was responded to by Professor Galbraith, Professor Coleman and Mr. E. A. James. Mr. MacGregor then sang "Soldiers and Gentlemen," and as an encore, "The Death of Nelson." "Our Patriarchs," proposed by the Vice-Chairman, was ably responded to by Messrs. Niven, Dickson and Chipman. "The Ladies," coupled with the names of Messrs. T. B. Speight and Howard Dixon, brought forth some feeling references from sympathetic champions. A volunteer toast, "The Ontario Land Surveyors," was then proposed by Mr. Aubrey White, who coupled with it the name of Mr. G. B. Kirkpatrick. By special request Mr. Niven sang "Bonnie Dundee," and Mr. Sewell sang "The Extension of the Railway." All then joined in singing "God Save the King" and "Auld Lang Syne," and dispersed, apparently well pleased with the evening's entertainment.

A detailed account of receipts and disbursements is, according to custom, filed with the Secretary-Treasurer, and for the benefit of those who are unable to be present at the Annual Meetings and Dinners, your Committee beg leave to state that the cost of the dinner is partially covered by the subscriptions of those attending the same, the remainder being a charge upon the generosity of the Secretary-Treasurer. In this way the general funds of the Association are not drawn upon for the social part of the Annual Meeting.

A. J. Van Nostrand,
Chairman.

Question Drawer.

Mr. J. D. Evans—I have not at present any report to make. There is only one question so far that I know. The question is submitted by Mr. Silas James, of Toronto: The Dominion Government sold a "fractional" section, said to contain 591 acres, to Mr. Smith, the remainder of the section being covered with water. After the sale the whole section became dry land. To whom does the portion that was covered by water belong?

I understand part of this section was covered with water. Was it part of a lake or river?

Mr. James—I suppose it was a lake.

Mr. Evans—Has it been drained off?

Mr. James—No; not that I am aware of.

Mr. Evans—How is it that it is dry?

Mr. James—Probably the survey was made in a very wet time, and now it is a dry time, when it has become perfectly dry. I suppose that is the case; I don't know as a matter of fact.

Mr. Evans—Is there any boundary to show where this was?

Mr. James—Yes; the survey of the township would show that.

Mr. Evans—On the ground?

Mr. James—Yes; in some cases it would. In this particular case I think so. But it is more for the general information of Surveyors that I would like to have a pretty full expression of opinion on the question as to who is the owner of that piece of land.

Mr. J. H. Shaw—Is it under the Dominion Lands Act? Under the Dominion Act I understand that if the chainmen can wade it, it is a marsh; if they cannot it is a lake.

Mr. James—It is really a conveyance by the Crown to a colonization company, and the conveyance is made to them under this description, precisely the same in all cases, as far as I can understand. You will see by the description put in brackets that the word "fractional" is used. What does that mean? A large number of conveyances have been made similar

to this; and now it is a question being taken up between the colonization company and the Dominion Government. I would like to get an expression of opinion as to who are the owners of the land that was covered with water, but is dry land now. I know of one instance myself where 228 acres were sold in the Township of York to an individual; he bought the lot and paid for 200 acres, but yet he has 228 acres. Now the Government would have just as good a right to claim that twenty-eight acres as the Dominion Government have to claim that they are the owners of the part that is dry but was covered by water and referred to in the description. They sold the whole section. I won't express myself on that because I am interested.

Mr. Niven—Does the Government take the position that they own it?

Mr. James—Yes; the Government does take that position; they say they own it.

Mr. Niven—You say it was a slough or pond when it was surveyed?

Mr. James—Yes; I presume so.

Mr. Evans—Surely the owner of land fronting on the water has the privilege of going into the water for docks or anything else where it is navigable; there are lots sold for 132 acres that contain 400 acres.

Mr. Sewell—I think the Dominion rule is where a pond contains twenty acres or upwards it is surveyed. The question is, is the water navigable or is it not? If not, it can be purchased from the Government; if it is navigable, it comes under different regulations.

Mr. James—I think in this case the water was not navigable; it was simply a slough or pond.

Mr. Sewell—Then it is a question what the original patent called for.

I was looking up lots some time ago through which the River Credit ran, but the patent did not describe it; it mentions the existence of water, and I concluded that the land absolutely belonged to the purchaser.

Mr. Fawcett—It is a question of water area. I have had many opportunities of looking into this; I know of one Surveyor who got into considerable trouble over this question; he was examining land for the Saskatchewan Company, and the year he examined it, it happened to be a very wet season, and he returned as water area land that afterwards proved to be valu-

able meadow land; and that brought on litigation, I think, between the Dominion Government and the company in question; and the Surveyor got into trouble as a result. At the time he sent out circulars to different Surveyors asking them for a definition of water area, but the result of his survey was that he got into trouble with the Department and he was suspended for one year.

As Mr. Sewell has said, the rule is when you come across a lake or pond and from appearance it does not exceed twenty acres, you do not trouble about it. We are not asked to traverse it; and if the Dominion Government transfers that land, the water area goes in as land. They do not take anything from the price of the land on account of having a body of water not exceeding twenty acres.

Mr. James—Would that include the area of slough as well?

Mr. Fawcett—Yes; it would all be sold as land. If it did not exceed twenty acres, in former years, Surveyors generally were in the habit of calling land on which there was no vegetation "water area"; after that, specific instructions were given that all water traversed would be the area covered by water at the time of the traverse; but if there was a large marsh dried up, or a pond dried up, that would not be considered as a water area. But if you happened to be traversing in August, when the water was very low, you would just return that part as "land covered by water." As to the ownership of the land, that is the question.

Mr. James—That is the question I am anxious to find out.

Mr. Fawcett—As to whether in after years the Government can say, "This water belongs to us," or not, I could not say.

Mr. James—The area is mentioned.

Mr. Fawcett—About seventy acres of water area probably; so that the Government has only conveyed so much land. But of course it has not been described properly. I think that would be considered all the land contained in that section.

Mr. Evans—The original plan shows that; here it shows the water traversed.

Mr. James—No; I think no water traverse is mentioned on the plan. It is simply that the Government conveys that section. There is nothing else in the conveyance except what is in the description; and they sell and get paid for just the amount of area that is mentioned.

Mr. Sewell—There it is only 591 acres instead of 640. The water belongs to the Government, there is no doubt about that.

Mr. Evans—If it becomes dry land afterwards?

Mr. Sewell—That makes no difference; it belongs absolutely to the Government.

Mr. James—Do they say "the section" in the description?

Mr. Sewell—That has nothing to do with it. Supposing a Surveyor went there and it was a time of a flood, and he made a survey of the whole section and returned, say eighty acres, and I come along and buy that eighty acres and you go and settle on that 640 acres and claim the whole thing, that would be an injustice to the Government.

Mr. James—Leave out the Government altogether and say, A and B.

Mr. Sewell—I know, but it does not apply. What the Government has not deeded belongs to the Government.

Mr. James—They deed that section.

Mr. Sewell—I am taking an extreme case. Suppose that I make a survey of a section and I return the amount of land as eighty acres, and you come along and buy that section and pay for the eighty acres, you have not a right to the water-covered acres of the section. It is the same in Ontario.

Mr. Evans—It seems to me if the buyer were to call for a whole section and then specify so many acres, that might be one way of getting at it; but if it is described as a "fractional section" and so many acres, the word "fractional" comes in and means only part of that section. Any deed given in Ontario that says "Lot so and so" would cover the whole lot.

Mr. Sewell—If you have "more or less," that makes it different.

Mr. James—It is "more or less."

Mr. Sewell—Then that covers it; that makes all the difference. Supposing I make a survey of the section, and it has been flooded at the time I make the survey, but if you get "twenty-three acres more or less" in Ontario, the chances would be, in nine cases out of ten, that you would get the whole section, in the way they generally give deeds here. When you get deeds in Ottawa you will find the reverse; you won't get the section, you will simply get the number of acres specified.

Mr. Dickson—I think the whole thing about water area in Manitoba is wrong. The instructions are to take the surface of the water just as you find it. In the month of May the surface is one thing, and if you go in September you will find several chains difference. I think it should be in the Dominion

as in Ontario, where we take high water mark all the year round. Last year I was out in Saskatchewan and I had occasion to subdivide a certain township, and I had two plans of the same boundary made by two different individuals; one plan showed a large permanent lake and the other showed a marsh. I think they were both perfectly honest. The law should certainly be amended. Any man of experience can tell when he sees it whether it is a permanent lake or merely the production of beavers or something else, and he should be allowed to calculate to high water mark. In a township where I was last year I found a considerable body of water and I had to wade through it—it was better to wade through it than to go round. As I waded through it I came to a fence. They told me they never saw so much water there before. That fence had been under water for the greater part of a year.

Some amendment is to be made to the Manual, whereby all permanent water is to be traversed; and I think when there is permanent water over fifty acres, it should be traversed. No matter how small the body of water is it should be taken out of the land, because a man has no right to pay for what he does not get.

Mr. Evans—The margin of the vegetation would be a very good line to take.

Mr. Dickson—That is what I take.

Mr. Evans—That would not be high water mark or low water mark.

Mr. Dickson—It would be a fair water mark.

Mr. Fawcett—The majority are of the opinion that the proper water limit is where the vegetation ends.

Mr. Niven—In the case before us, it being a fractional section and a deed of so many acres, the water evidently belonged to the Government. If it has evaporated and become dry land now, I think it still belongs to the Government.

Mr. Wilkie—As one of the members of the Committee on Land Surveying in Ontario, I would not like to give a decision on this question. The survey is under the Dominion Government and is not within our province at all. The question having come up the discussion will no doubt do a great deal of good, and I am very glad to have heard it; but our system of surveying is not exactly the same.

I take the view Mr. Niven has just expressed, and it seems quite plain that when A conveyed the "fractional" section,

whether he was the original owner or not, he did not intend to convey the full section. It is a question whether the whole section is meant here, as the word "fractional" written here is put in in brackets. It is probably a question we could talk about and come to all the decisions we chose in the matter, but it would finally have to be disposed of by the courts; that is the only way, according to my mind, in which these questions will be settled. It is unfortunate, but I do not see any other way out of it.

Mr. Fawcett—"Fractional section" either arises from water area being in the section, or it may arise from the section adjoining a correction line, or some line where a connection is made with a line formerly run, where the section line may be too short. That would be a fractional section. A fractional section might exist without any water area, and very often does. It might be an over-plus.

Mr. Wilkie—It is not stated in the question, but it says "Formerly water, now dry." That gives the cause of the "fractional section." It is quite plain A did not intend to convey the whole section; if he had intended to convey the whole section he would have put it in "640 acres, more or less," instead of "591 acres, more or less."

Mr. Dickson—What is meant by the term "More or less"? It is something I have never been able to define.

Mr. Fawcett—It means that the thing is governed by the limits, whatever the limits are.

In connection with that there is such a thing as reclaimed land, that is, land returned in the original survey as "water land," or "marsh land," or "lake land." The Manitoba Government owns the water or swamp lands in Manitoba, and if by drainage these lands are reclaimed and made valuable, the Government owns them.

Mr. James—I would like to ask if there is any gentleman here who knows any case that has been decided in the courts that would bear upon the subject. Supposing a case similar to this was taken into court and tried and a finding made, that would be an authority. If any gentleman knows any case of that kind I would be very much obliged to him if he would mention it.

Mr. Sewell—I think the best plan would be to follow the rule and ask the opinion of the Surveyor-General; you cannot get past it.

Mr. James—The Dominion Government has positively refused to refer it to the law courts. What we want to do is to get

a similar case. They contend one way, and the colonization companies contend the other way.

Mr. Fawcett—Perhaps Mr. John Moore would give you some information; he was acting for the Saskatchewan Colonization Company. I understand they have obtained valuable lands that have been reclaimed.

Mr. James—Mr. Moore was acting for one of the colonization companies, and I think that company is occupying under protest; it stands in that shape—nothing settled. The Registrar at Regina refused to accept a conveyance made in that way; and to protect themselves they put it "under protest," and accepted a sale of a section without selling this part of the land; and they have paid the Government, I think, at the rate the Government asked under protest; and that is the way that the matter stands.

Mr. Chairman—I see in the description here it says, "This is to certify that B is now the owner of, in fee simple, the whole fractional section." In my opinion on the word "fractional" inserted a great deal depends, and I think there would be great stress laid upon that if it came into court. It is my opinion that the man would own the whole thing if the word "fractional" were not put in. The word "fractional" shows there was some reason why the whole section was not conveyed; and the field notes, or plan, or something on the ground, would show the reason why that word "fractional" was put in. The word "fractional" being there would have very great weight in deciding the case in a court. Without that I think the man would be the owner of the whole section, even though the exact acreage was mentioned with the words "more or less" after it.

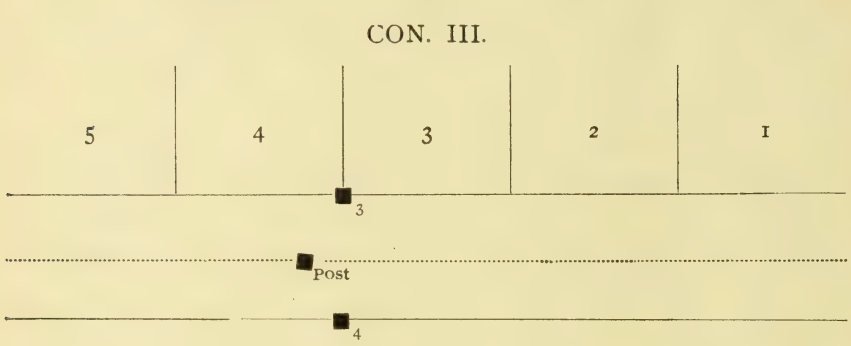
It is unfortunate that there was not something more definite mentioned in the description to show why it should be that acreage; or to determine whether he was to get the portion covered by water, or whether it was reserved. But with the description just as it is, in my opinion he would only get the portion that was not covered with water at first.

Mr. Fawcett—If the water happened to be entirely surrounded by the land and he owns the land I think he owns the water.

Mr. James—In many instances that is the case.

Mr. Shaw—There is another question I would like to bring up. I want to know how to fix the southwest corner of Lot 3, Concession III., as shown in diagram in a double front concession. All three posts are there. The line from the posts marked three and four does not come within twenty links of

the center post. The question is, shall the line be run from the post on the side, or shall the center post be taken?



Mr. Shaw—Supposing the distance between the outer posts was only ninety links.

Mr. Dickson—You would have to go by the posts.

Mr. Shaw—That gives a narrow road allowance.

Mr. Dickson—You cannot go beyond the post; I think the posts must govern. As the law now is, if any one of the posts is found and the other two lost, that one must govern. It used to be that the post had to be found on each side of the road allowance; for instance, on the north side of the road allowance if you could not find the post but found them west and south you had to run until you found the next post; but the law now has been amended, as I understand it, that any one of the three posts governs. Any lines I have run I have always run from posts at the original boundary of the road allowance; I think that is correct. Perhaps the posts had been moved.

Mr. Shaw—No; they had not been moved. The simple fact that there were bearing trees showed me that they had not been moved.

Mr. James—The line along the outside of the road was not run in the original survey.

Mr. Shaw—No; the center line only was run.

Mr. James—The stake at the center line would give the distance along the front of the lot; whereas the stake on the outside limit of the road would not give the original measurements; consequently if you take a stake you would be giving more or less—

to the one man more and less to the other; and it would seem to me that the stake on the original line would be the one that should be made use of.

Mr. Shaw—You would take the center stake?

Mr. James—I would be inclined to think so.

Mr. Shaw—And disregard the side posts entirely?

Mr. James—I would be inclined to.

Mr. Shaw—Does that accord with the Act?

Mr. James—As a Surveyor, wouldn't you exercise your judgment in that respect? Where a line is run in the original survey, I think that would be more likely to be taken than to take the outside post. Although the Act may say "the outside post," still, I think that it would be the center stake in the middle of the road allowance, where the bearing trees would be—there would be bearing trees there.

Mr. Shaw—Do you mean blazed trees?

Mr. James—Yes, blazed trees.

Mr. Shaw—There would be blazed trees to the center line, and bearing trees to the side lines.

Mr. James—In my surveys those were the ones bearing trees are taken to.

Mr. Shaw—This is a thousand-acre block system.

Mr. Sewell—If you have a bearing tree you have to refer back to this and re-locate the post from the notes.

Mr. Shaw—Can you take a bearing tree and say the bearing tree is the post?

Mr. Sewell—No; the bearing tree is not a post.

Mr. Shaw—Is it any better than a tree marked as a post with the numbers on it?

Mr. Sewell—That is a post.

Mr. Dickson—That center post is not recognized in law as a post at all; it is simply marked with the letter R on each side of it, and the correct chaining is taken to that, but it is merely planted as a guide post. Whereas, the posts on each side of the road allowances are marked with the number of the lot and concession, marked in the field notes as the boundary of the lot.

Mr. Fawcett—I noticed where I was last summer with regard to some posts that had been planted about fifty years ago in Algoma on the shore of Lake Superior, not only the posts were marked with the numbers, but also the bearing trees, besides "BT." If a person had not found the posts he might have taken the tree as a post.

Mr. Dickson—Were they far apart from the posts?

Mr. Fawcett—Ten or fifteen links.

Mr. Sewell—You have to go by the field notes. If they define it a bearing tree then it is a bearing tree; but if a Surveyor marked the tree BT and he does not return it in his notes, it is not a bearing tree at all. If the field notes show that there is a bearing tree, they will define that it is bearing so many degrees and so many links, and then you go and lay the angle off from that post and retrace the bearing and put down your post, and that is the corner because the bearing tree indicates it; but otherwise the bearing tree is no more good than any other tree in the wood.

Mr. Shaw—You don't take the bearing tree in preference to the post?

Mr. Sewell—If I cannot find the post I can retrace and redetermine it by the bearing tree if the tree is recorded.

Mr. Shaw—But if the post is there and the bearing tree, and both agree, are you going to take the side post?

Mr. Sewell—Take the side post always.

Mr. Niven—The diagram on the board represents a case that occurs very frequently in the back country. The Surveyor measures along the center line and puts a post say at the end of the twenty chains. He should have put the other post at right angles to it, but a good many chainmen have a way of standing on the line, so that sometimes they do not get the correct position within two feet—sometimes not within twenty links; the posts, however, are put in, and there is no doubt they are the original posts. That being the case you must just take them. Take that numbered post at the southwest angle of lot three and run the line from it. Mr. Shaw says the road is not a chain wide there. I would let the other post alone and put another post behind it fifty links from the center line, but run your line between 3 and 4 from that post; in the same way I would run the other line from the post below.

Mr. Shaw—But you would get the road allowance a chain in width.

Mr. Niven—Yes; but where even the posts are put I don't think you have any right to change them, but must run from where they are.

Mr. James—But supposing there was no bearing tree for the stake at the outside of the limit of the road, but there was one for the center of the road?

Mr. Niven—But there never is for the center posts.

Mr. James—That is where they are in surveys I have made.

Mr. Niven—There were none where I have surveyed, nor have I ever seen them. The bearing trees are put for the posts at the side of the road.

Mr. James—The stake that is planted on the line is more likely to be accurate than the one on the side, so you would not be depending then on the chainmen, who do as Mr. Niven says; they would not have to do that. The stake in the center of the road would be the one.

Mr. Shaw—Have we to go by what the chainmen do, not by what should be done?

Mr. Niven—Yes; most decidedly.

Mr. James—The field notes would govern.

Mr. Shaw—Would you take the field notes in preference to the actual work on the ground?

Mr. James—I would take the field notes so far as the original survey was concerned. Supposing the original survey showed that the line was run up the center of the road and the stakes planted there for the lot limits and bearing trees taken for that stake; but the stakes that were planted at the out-limit of the road had no bearing trees, then most decidedly I would take the center stake.

Mr. Shaw—In this case the bearing trees were marked for the side posts.

Mr. James—That makes a difference.

Mr. Sewell—Sometimes posts move about.

Mr. Shaw—In this case they hadn't. The posts are there and undisputed. There is no evidence of the post having been moved. You can sometimes find a post that nobody knows about.

Mr. James—The field notes would show whether the line was run on the outside or on the center of the road.

Mr. Shaw—There is no dispute about this, it was run in the center.

Mr. Dickson—In double-fronted townships it is always run in the center, and a guide post planted.

Mr. Shaw—Another point I would raise—in a case where the post is missing and there is a bearing tree, should you take the center post or the one on the opposite side?

Mr. Dickson—I would take whatever the field notes said.

Mr. Shaw—Is that according to the Act?

Mr. Dickson—I think so. You will find out from the lot lines in what direction the post stood from the bearing tree, and take that.

Mr. Shaw—Suppose you found the notes showed north thirty degrees, east eighty links; and you found the bearing tree north thirty degrees, west eighty links, would you use this in preference to the tree that was blazed?

Mr. Sewell—Yes; if it took me to the center of the lot I would do it.

Mr. Shaw—If it took you out in the lake, what would you do?

Mr. James—It appears that the Act is intended to apply where the survey is mathematically correct; but where it is not mathematically correct, then I think the Surveyor has to use his own judgment. But wherever there is a stake with a BT showing where that stake should stand, it seems to me that without indisputable evidence that that stake is away out of place, it should be taken.

Mr. Shaw—Don't you think in some cases a Surveyor should use his judgment? Take a case like that of finding a bearing tree north 20° 51′ west astronomically, 50 links, and you find this bearing tree on the opposite side of the road, would you put your post on the opposite side?

Mr. Dickson—That is a case where a man would have to use his judgment.

Mr. Sewell—I would put it where the field notes said it should be. I would never consider that a Surveyor has any judgment; he is not acting as a judge, he has simply to go on the actual evidence laid before him, and he has to decide accordingly.

Mr. Dickson—I think in a case like that, where you say you found the bearing tree exactly opposite where it is shown to be on the notes, if I found the center post I would run from there.

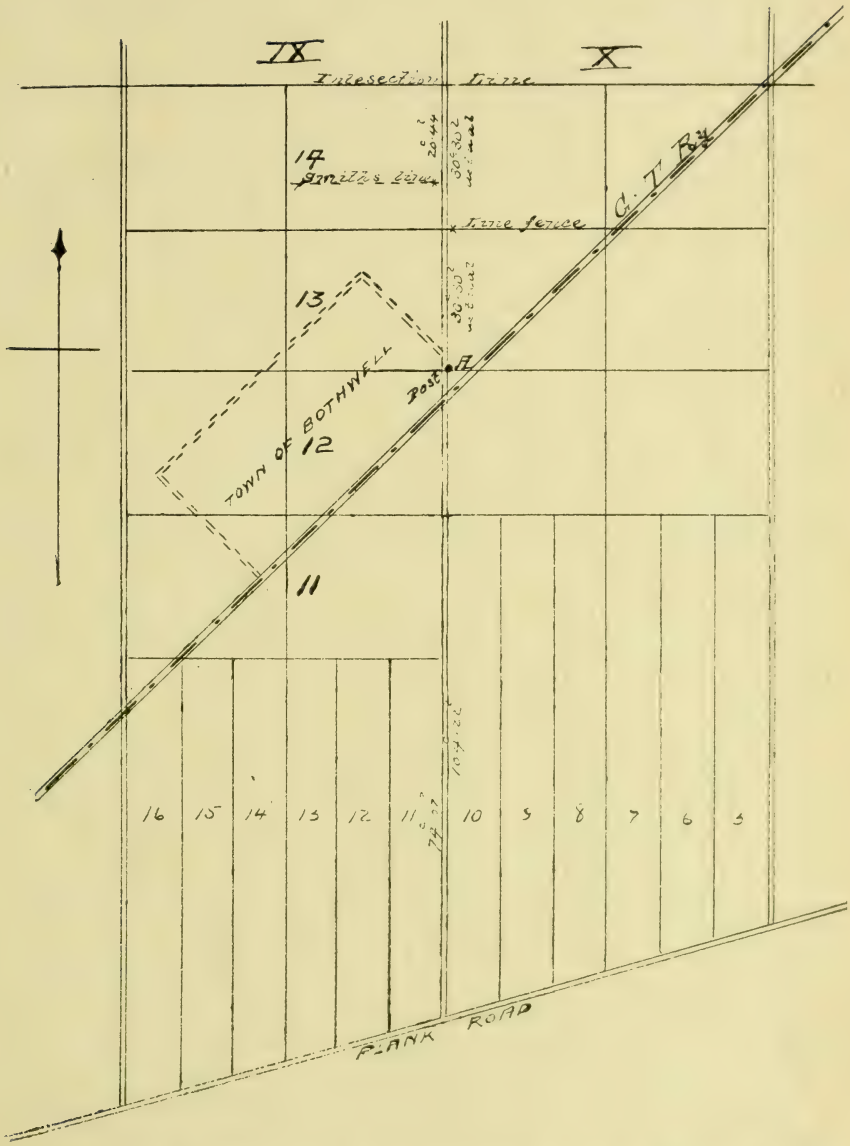
Mr. Shaw—You would disregard the tree?

Mr. Dickson—If I found the tree instead of standing northwest from the line, southwest, right opposite, showing everything was wrong, I would be inclined to take the center post and run from that if it were there.

Mr. Shaw—I wasn't talking so much about the bearing tree as the angle of the lot. The question is, does the road allowance establish a jog?

Mr. Niven—If you found the post you wouldn't alter the road allowance?

Mr. Dickson—I consider the posts at the boundaries of the



18 chains 89 links total actual dist from Plank Road to Intersection line

road allowance govern in all cases, if they are found in the field; if not found in the field, then take the center post.

Mr. Shaw—Should the undisputed posts in the field be taken if there is no evidence to show they are wrong?

Mr. Dickson—Yes; if there is no evidence to show they are not where they were originally planted.

The Chairman put a motion as follows: Moved by Mr. Dickson, seconded by Mr. Wilbert Gibson, that it is the opinion of the Association that the posts as found on the ground should govern for the angles of the lot. Carried.

The Chairman—There is one other question that I will try to bring briefly before you. I think Mr. Kirkpatrick is familiar with it, and if I make any error he will kindly correct me.

This diagram shows parts of Concessions 9 and 10 in the Township of Zone. I was called to run the line between the east halves of Lots 13 and 14 in the 9th Concession. I went on the ground and found there were no posts or fences on the west side of the road between Concessions 9 and 10 from the 14-15 Lot line, south to the Plank Road. This is a Government road, called the Plank Road, leading to Windsor. The town of Bothwell is situated in this block, and is mostly fenced, but in laying out the town no attention was paid to the side lines of the original lots, because the Grand Trunk Railway runs at an angle of about forty-five degrees with these lots, and the town was laid out at right angles to the Grand Trunk Railway.

In the original survey there was a line run through the township east and west between Lots 14 and 15, called an intersection line. This line is fenced straight through, and is not in dispute at all. I found a post on the east side of the concession road between Lots 12 and 13, Concession 10, at point lettered A, also a fence on the east side of the concession road for the line between Lots 13 and 14, Concession 10. I chained from the post I found at point A between Lots 12 and 13, Concession 10, to the intersection line between Lots 14 and 15, and found the distance to be sixty chains, sixty links, and the fence between Lots 13 and 14, Concession 10, exactly in the center of this distance, or within a link or two, thus proving that each of Lots 13 and 14, Concession 10, had an equal frontage of thirty chains, thirty links, with quite an old fence standing on the line between them. I therefore divided this distance of sixty chains, sixty links equally for my line between Lots 13 and 14, Concession 9, and ran the

line west to the center of the Concession, thus making the lines in Concessions 9 and 10 agree or come opposite.

This property in Concession 9 belonged to a company. They sold Lot 14 to one man by the acre, at $20 an acre, and then they sold Lot 13, or all that was not in the village plot, to another man, for a lump sum. The man who bought Lot 13, either at the time or after the purchase, found there was a discrepancy or a dispute as to the location of the line between Lots 13 and 14. He sent for me and asked me to go to the Registry Office in Chatham and find out, if I could, anything about Lot 14. I went down there, and found that in the original grant from the Crown the east half of Lot 14 was described as sixty-seven acres. Then I wrote down to the Crown Lands Department and I found that they had no field notes for this portion of the township between the intersection line and the rear of the lots fronting on the Plank Road. I also found that this Lot 14 had been sold to a man named Marcus as 100 acres, and he got Mr. Smith, a Provincial Land Surveyor, to survey it for him; and he found only sixty-seven acres. But he does not say how he found there was only sixty-seven acres. He gave a certificate to that effect on a plan, and sent it down to the Crown Lands Department. But so far as I could find out, there were no field notes with it, nor were there any instructions issued, it being apparently a private survey. The Crown Lands Department wrote to Mr. Marcus, saying when he made the next payment they would make a reduction for the price of this thirty-three acres. Marcus sold out his interest to another man, who sold out his interest to the late Hon. George Brown, who received the patent for the sixty-seven acres, it being described as commencing at the south-easterly corner, thence north twenty chains, forty-four links, instead of thirty, the proper distance; thence to the center of the concession, thence south twenty chains, forty-four links, and thence to the place of beginning. The question is, could that survey be disputed from the fact that there were no instructions issued by the Crown Lands Department, no field notes made of the survey to show how it was ascertained to be sixty-seven acres before the Crown Lands Department issued the patent for that amount?

Mr. Sewell—I think part of that land that has never been deeded with the lot belongs to the Crown. Is there "more or less" in the description?

The Chairman—There is.

Mr. Sewell—If there is no "more or less" this part belongs to the Crown undoubtedly.

Mr. Jones reads description.

Mr. Sewell—Did you find any posts?

Mr. Jones—No, excepting this post at A.

Mr. Sewell—If you cannot find the post the remainder belongs to the Crown. What does the grant show? Does it show more or less than sixty-seven?

Mr. Jones—There is no "more or less."

Mr. Dickson—Does the description call it "the half of the lot"?

Mr. Jones—It says "The east part of Lot 14."

Mr. Dickson—That was never meant to be the half.

Mr. Jones—I would not swear as to that, but I think it was.

Mr. Sewell—If it is the east half, that is what it is, and the rest belongs to the Crown.

Mr. Dickson—It does not mean the east half.

Mr. Jones—It is the "east part" in the description.

Mr. Kirkpatrick—Is not the question you asked, that you found according to the survey by that man Smith, that he gave a certificate, that instead of the lot being thirty chains wide on the front, he found it twenty chains and forty-four links? As you read it, it commenced at the south-east angle of the lot, and went to where a post has been planted at the north-east angle of the lot. That gave you the whole front of the lot.

Mr. Jones—Yes.

Mr. Kirkpatrick—Then you went a certain distance back to the center of the concession?

Mr. Jones—Yes.

Mr. Kirkpatrick—And then you go south twenty chains, forty-four links, more or less, to the south-west angle of the lot, and then you come back to the place of beginning? You get what was granted. I understand there was no original survey, no field notes. The Crown adopted Mr. Smith's survey, there never has been any other survey before or since, and what you are troubled about now is to find whether the line that you ran at thirty chains is right.

Mr. Jones—Whether it would be the correct line between Lots 13 and 14?

Mr. Kirkpatrick—The question is narrowed down pretty well to this: Did the Government accept Mr. Smith's survey as the original survey when they accepted his statement that he could

only find twenty chains, forty-four links? With this light on it I looked into it and I could not see how it was he had found that; but the Government accepted it and granted it to the Hon. Geo. Brown by patent some years afterwards, as you say.

Mr. Jones—The impression I have as to how Smith came to make the frontage of Lot 14 as twenty chains, forty-four links, is as follows: In 1845 Springer, P.L.S., was instructed to make a survey of the narrow lots on the north side of the Plank Road, and fronting on the same, through this township, which he did, and returned plan and field notes giving the depth of Lot 11 fronting on the Plank Road as 74 chains .07 links, but does not say in his notes how he determined that this lot should be that depth, though he does on the other concession roads, or at least some of them, viz., by chaining south from the intersection line and giving each of the ordinary lots in the concessions their thirty chains frontage and leaving the balance as the depth of the lots fronting on the Plank Road. Smith then in 1853, when surveying Lot 14, evidently started chaining from the Plank Road north, giving Lot 11 frontage on the Plank Road its depth of 74 chains, .07 links, as shown in Springer's plan of survey, and then continued chaining on north to the intersection line, giving each of Lots 11, 12 and 13 their full frontage of thirty chains, when he found he had only twenty chains, forty-four links left for the frontage of Lot 14 to the intersection line, and gave his certificate that that was all the frontage there was for the east part of Lot 14, Concession 9, for the total chaining on the ground now between the Plank Road and the intersection line would bear this theory out.

Mr. Dickson—Did the actual measurement on the ground agree with the description?

Mr. Jones—That would correspond with the description.

Mr. Dickson—After giving Lots 11, 12 and 13 each thirty chains, did the distance you found agree with Mr. Smith's description?

Mr. Jones—Yes, within a few links.

Mr. Dickson—That settles it pretty well.

Mr. Niven—I think under the circumstances you will have to assume that that twenty chains, forty-four links as given by Mr. Smith would be the correct measurement.

Mr. Dickson—I think so.

Mr. Niven—And make your surveys in accordance with that, taking for granted there was just that much land there and no

more, there was not enough to give every lot thirty chains. I think the patent issued by the Government at that time would take the place of the original survey; that would be my idea.

Mr. Dickson—It is half a century since Mr. Smith made his survey.

Mr. Shaw—Can any notes be found of record of Smith's survey?

Mr. Jones—No; neither notes nor instructions. It was a private survey; the man that bought the land employed him.

Mr. Shaw—Can his private notes not be obtained?

Mr. Jones—They might possibly. His descendants still live in that neighborhood.

Mr. Shaw—If his private notes show any reference to his original work they could be taken.

Mr. Jones—But how did he know when he came to the rear of these long lots, and began measuring thirty chains? They state "measurement on a plan."

Mr. Dickson—You don't know how he arrived at that?

Mr. Jones—No, I cannot say how he arrived at that.

Mr. Dickson—If you found his measurements and the notes tallied pretty well—

Mr. Jones—Before Mr. Smith made his survey, when the long, narrow lots were surveyed by the late Mr Springer, he gave his distance up to that corner, but he went no further. Mr. Springer gives 74.07 as the distance there. He does not say how he ascertained that. But when he started these narrow lots on the next road he mentions how he determined it, that he chained down from the intersection lots, giving each lot its full chainage and leaving the balance between them and the Plank Road in these long lots.

Mr. Wilkie—Does he give the distance for the long lot opposite that 74.07?

Mr. Jones—Yes; thirty chains more, so that that would come opposite the next full or ordinary concession lot. I think Springer's survey was made in 1845, and Smith's private survey was made in 1853, eight years afterwards.

Mr. Shaw—Was there a survey previous to Smith's?

Mr. Jones—Yes; Springer's was previous to Smith's. That was a Government survey, a survey of these narrow lots. Springer didn't survey Lots 11, 12, 13 and 14, Concession 9. I imagine that when Smith came on the ground eight

years after Springer, the two posts, planted one on each side of the concession road for the rear of the Plank Road lots eight years before by Springer, would be standing there. But that is only supposition.

Mr. Dickson—I think everything tends to show that your conclusions are correct, and that is how he did do it.

Mr. Jones—It would appear so on the ground. But the question is, would that survey of Smith's be accepted by any court owing to the fact that the Government had granted the patent according to his survey that he sent in, or his certificate?

Mr. Dickson—I would like to know whether it is "east half" or "east part"?

Mr. Jones—I could find that out for you.

Mr. Dickson—I think it was meant to be the east half.

Mr. Wilkie—It says, "Commencing where a post has been planted at the south-east angle of said lot."

Mr. Dickson—It is by metes and bounds.

Mr Jones—Probably there may be a little discrepancy between them, starting it as the east half and then going to each corner of the lot.

Mr Wilkie—The patent has been issued and recorded assuming that that was the whole of the lot, apparently.

Mr. Jones—Yes; and probably they did not like to say the east half on account of it not being 100 acres.

Mr. Sewell—What troubles me is, this point has been determined by previous survey. Wouldn't it be correct to measure these four lots and divide them up? What right have you to leave the balance in Lot 14?

Mr. Jones—Because it is patented in that way.

Mr. Sewell—The plan shows it to have been equally divided. I think the Government's intention was that it should be divideded into four equal lots.

Mr. Jones—I would like to run it out that way.

Mr. Sewell—I think you would have to apply to the Government for the fractional part in between; this piece of land actually belongs to the Crown. You apply to the Crown and you will get it; submit a proper survey.

Mr. Jones—I would like to work it that way, but I am a little afraid.

Mr. Shaw—Does not the description say it starts from a post planted at the south-east angle?

Mr. Jones—Yes; but there is no post there.

Mr. Sewell—There was a case like that in one of Passmore's Crown Lands opinions; there was a chain of difference between them. Passmore said, "If the parties have been occupying for seventy years they can hold it against the Crown, if not they have got to submit an actual survey of the lot and get a patent from the Crown." That is the only way you can deal with it.

Mr. Jones—That is not exactly the same.

Mr. Sewell—Yes; there is an overplus.

Mr. Jones—No, that has been patented as sixty-seven acres, and this is 100 acres.

[Further documentary evidence having been found in the Crown Lands Department regarding this case, the discussion will probably be resumed at the meeting in 1904.]

Papers.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

COUNTY ROADS.

BY MR. CAMPBELL.

The appropriation of one million dollars to aid in the improvement of public highways, by the Provincial Government, has already served a most useful purpose in arousing interest in behalf of better roads.

The aim of the Act is not to oblige the building of an expensive system of complete roads, but to secure uniform and systematic work, to employ and properly operate modern and economical implements, to provide careful, constant, and methodical supervision and maintenance, to provide object lessons in the care and treatment of roads and set examples for those having charge of the remainder.

The measure is not one which demands a large expenditure from the municipalities acting under it, but it is designed to do the greatest amount of good by aiding the counties and townships to help themselves. All the expenditure placed on roads will be spent in the county, and thus returned in a great measure to those who contributed it in the first place, together with the Provincial grant.

This Legislative grant is for country road construction only, and is a means of requiring the urban municipalities to aid in the maintenance of the common highways, from which they derive a great benefit, without, heretofore, sharing in the cost. As an illustration, the city of Toronto, containing about one-tenth of the population and wealth of the Province, would ordinarily be entitled to one-tenth of the $1,000,000, or $100,000. None of this grant, however, is spent within the limits of Toronto, but all is spent on the roads of rural or township municipalities.

By-laws under the Highway Improvement Act have passed all stages in Wentworth, Simcoe and Lanark, the Wentworth

by-law including the purchase of all toll roads within the county. Hastings and Wellington already have systems of county roads, which they propose to bring under the Act. Action towards systems of county roads has also been taken in the counties of Carleton, Elgin, Frontenac, Prince Edward, Lennox and Addington, Huron, Middlesex, Victoria, and Brant.

In Simcoe, one of the largest counties of the Province, the by-law provides for establishing a system of 350 miles of leading roads. This having failed to receive the assent of over two-thirds of the township councils, as required by the Act, was submitted to a vote of the ratepayers and carried by 1,457 majority. The Wentworth by-law, providing for the purchase of thirty-eight miles of toll roads, to be included in a county system comprising 100 miles in all, was also submitted to a vote of the ratepayers, and carried by 966 majority. The Lanark by-law provides for a system of 100 miles, and 300 miles are proposed for Carleton.

The preliminary step taken by county councils has been to hold a conference of all municipal councillors, or representatives of councils within the county. At these conferences, the majority of which have been attended by the Commissioner of Highways, the meaning and intention of the Act has been discussed, and to some extent a plan of roads considered.

It then rests with the county council to pass a by-law definitely laying down a system of county roads. A copy of this is sent to each township council within the county, and they have three months in which to consider it. Each council, will, within the three months, report to the county council their acceptance of the plan, their rejection of it as a whole, or such alterations in the system of roads as would meet their approval. If a township wishes roads taken other than those proposed by the county, in case of failure to agree, the matter will be submitted to arbitration. If more than a third of the municipalities oppose the by-law as a whole, the question must be submitted to a vote of the people. If the by-law meets the acceptance of the municipal councils, or two-thirds of them, the county council may, at the end of three months, proceed to perfect their plans for the improvement of the roads.

THE ALTERNATIVE PLAN.

Provision is made that county councils shall have until January 1, 1904, in which to take advantage of the Act. Failing to

do so, township councils which fulfil the necessary conditions may then take steps to obtain their proportion of the Provincial appropriation. The requirements for townships will be, as nearly as practicable, the same as for counties. That is, a certain mileage of roads to be improved must be designated, and the work done will be in accordance with suitable regulations. The work will be confined to leading roads, not greater than would be undertaken by a county system, in order that the improvement may be of a durable character. The township will be entitled to one-third of the cost of the work, up to, but not exceeding, its share of the appropriation.

REASONS FOR A COUNTY SYSTEM.

It is objected to township control that the township council, having charge of all the other roads in the township, as well as these special roads, will be influenced after the first expenditures to make future municipal expenditures on other roads, and those which have received Government aid will be neglected. While other roads in a township remained unimproved, many councils, after once improving a road under the Act, owing to local jealousies, would find it impossible to make a sufficient yearly expenditure to properly maintain it, and under such circumstances the first outlay would not accomplish its chief mission.

County councils, on the other hand, would have charge of these few leading roads only, all of the one class, so that the most economical but efficient system could be adopted with respect to them.

Under county control a properly organized corps of men can be employed to build and repair the roads. As at other employments, they become experienced and do better work, and in the matter of repairs are ready to make them as soon as signs of wear appear.

In a county plan an experienced and properly qualified man could be employed to have constant supervision of the work, whereas under township control each municipality cannot afford to pay the salary of such a man. Under every good system it is necessary to have responsibility centralized and defined, not divided and easily shifted from one to another, as it now is under statute labor methods.

Under county control, modern machinery, too expensive for individual townships, can be purchased and handled to advantage, an experienced operator can be employed for each implement and a better and more uniform class of work will be secured.

A greater cost to the individual citizen need not be feared, as no greater road mileage is to be maintained. The effect of a county system is merely to group the most heavily traveled roads under one management, where they can be most economically maintained.

By a county plan, uniformity of work and system will be immediately secured throughout the various municipalities. Under township control it is by no means likely that the various townships would act in unison—at best there must be delay, while here and there a township will not take advantage of the Act.

THE TOWNS ASSIST UNDER THE COUNTY SYSTEM.

One chief object in recommending that certain roads be cared for by the county council is to obtain from the towns and villages in the county a fair share of assistance in keeping up the leading roads. There can be no question as to the justice of requiring the towns and villages to contribute towards the cost of this work. Towns and villages are benefited by the improvement of roads, and the county should not hesitate to assess them. This can be done through the county council only. It is not the intention that any of the money should be spent in the towns, but that all should be spent in the townships. Where the county has to raise two-thirds of the total amount, such a percentage of this will be contributed by the towns as to make their contribution, added to the Government grant, equal to about one-half the cost of the work. Where the townships, instead of the county, take advantage of the Act, towns and villages cannot contribute in this way. Under a county system, a portion of the cost of road-building is levied, in the county rate, against the towns and villages within the municipality for road purposes. At the present time, under township systems, the farmers bear the entire cost.

The total assessment of the townships of the Province is $458,811,926, and of the towns and villages $129,771,310, the latter being twenty-two per cent. of the combined assessment of towns, villages and townships. Thus under the average county

system, the towns and villages would pay twenty-two per cent. of the amount raised by municipalities for construction and maintenance; whereas under the township system the township cannot obtain this assistance.

Under the county system, for every $1.50 spent on constructing the roads, the Province pays fifty cents, the townships seventy-eight cents, the towns and villages twenty-two cents. Where the townships individually take advantage of the Act, the Province pays fifty cents, and the townships one dollar.

While there may be some feeling adverse to townships parting with the control of any of their roads, it is nevertheless impossible, under a township organization, in the case of heavily traveled roads, to levy the necessary taxation equitably, or employ the most economical and at the same time serviceable system. The trend of opinion has turned towards collecting the most important roads of each county, and placing them under the management of the county council. It has been shown that by such means roadmaking can be placed on a more business-like basis, and consequently greater efficiency is secured. It provides for a more equitable system of levying the cost, for a better use of modern machinery, and for a higher grade of oversight and workmanship. At the present time township councils are unable to maintain the roads by statute labor, and are in consequence compelled to make annual appropriations of money from the general tax. This money is, in the main, spent on the roads which would comprise a county system, but owing to the contracted character of the township system, township councils cannot expect to apply this expenditure to the greatest advantage.

DISTRIBUTION OF EXPENDITURE.

The distribution of the expenditure, where the work is undertaken by a county council, is not defined by the Act, but is left almost wholly to the judgment of the county council. It is not required that the expenditure shall be in proportion to the assessment of the various townships, to their area, nor road mileage, but this may be determined if so desired by the county council in framing their by-law.

The Act does suggest, however, that the mileage of roads to be maintained by the county shall be, as far as practicable, distributed among the various townships in proportion to their area, in order that all the townships may be benefited.

The actual improvements may be placed wherever they will be most serviceable and effective in bettering the condition of the roads. It is quite possible to conceive of a case in which the greatest benefit to one township will arise in making almost the whole expenditure in an adjoining township. Take as an example a township where road material is plentiful and where liberal use of it has been made on the roads, bringing them all to a good and serviceable condition. If the people of this township, in order to reach their market town, have to pass through an adjoining township in which road material is scarce, and where, through the character of the soil and difficulty of drainage, road-making is difficult and expensive, and the roads bad in consequence, it is apparent that the greatest benefit to the first township will arise from building and maintaining a good road through the second township, leading to a common market. Having in view such a condition as this, of which instances are common throughout the Province, the reason for leaving the distribution of the expenditure to be governed by local circumstances will be apparent.

AMOUNT OF EXPENDITURE AND GRANT.

The amount of money a council may spend on the roads is not limited by the Act, except that, in case money is raised by the issue of debentures, these debentures shall not exceed two per cent of the equalized assessment of the county.

The only restriction is with regard to the amount to be received as Government grant, this to be one-third of the cost of the work, up to, but not exceeding, the county's proportion of $1,000,000.

This money, payable by the Government, may be drawn as the work progresses, and the rapidity with which it is drawn will depend upon the expenditure the county decides to make. It may be drawn in one year if a sufficient amount of work is done by the county. Or the work may be extended over several years, and the proper proportion of the money due under the Act will be paid from year to year as earned.

The roads to be assumed must not be confused with any previous county systems which have existed, many of these having become of secondary importance owing to the building of railways and the growth of new local markets. Only those

roads should be selected which can make good their claim to being still the roads of greatest travel.

This is a matter which county councils, with the advice of township councils, will undoubtedly view from a county standpoint, and by them the best possible selection will be made, so that it is not a matter upon which the Act places any restriction.

The roads to be assumed under a county system, should, however, be those which are most used by the public, and which will best serve the requirements of the people in each section. These roads may consist of one road in each township, or several roads; or part of one road, or parts of several roads, may be selected. As a general thing, they should consist of what are now the most heavily traveled roads in each township, leading to the market, town or village of the district.

The roads should preferably connect, so as to form a continuous system—but it is not necessary that they should do so. In some counties the trend of travel is all in one direction, leading to one market center. In other counties the trend of travel is out into a number of distinct sections, each township, it may be, having one or two market centers. Nor is the trend of travel marked by county or township boundaries, but divides according to local conditions, the most important factor in determining the line of travel being, as a rule, the nearest or best market. These circumstances must be all taken into consideration in framing a county system of roads, and the aim should not be so much a connected system as the most useful system.

STATUTE LABOR.

Whether the county or township council proceeds under the Act the statute labor assessed against the lands fronting on the improved roads may be commuted by the township council in which the lands are situated, if the council so desires. The property adjacent to the improved roads will undoubtedly derive a direct benefit which should render it liable to such a measure. The commutation money will belong to the township, to be used as the council may direct. A natural step would be to use it in improving other roads in the township; while some townships propose using it in paying the rate levied against the township for county roads.

CHARACTER OF IMPROVEMENT.

A fixed standard of road to be constructed is not defined by the Act, nor will it be controlled by the Department of Public Works. Expensive work is not desired. The nature of the improvement undertaken by any county must necessarily depend on many local circumstances—the work already done on the roads, the road material available, the extent of traffic, and similar details.

For example, in going over a road which falls within a county scheme, the first mile, owing to its having already been graded, gravelled, etc., to some extent, may only require patching and simple repairs to put it in good condition, at a cost of not more than $100; whereas, the next mile, unimproved and neglected, through swampy land, might cost $500 to drain, grade and gravel or stone. And the next mile, being at the outer end of such road, on favorable soil, and receiving but little traffic, might be made equally good and serviceable by proper draining, grading and a light coat of gravel, at a cost of a couple of hundred dollars.

It will be necessary for the county council to submit a report, showing what is proposed, but so long as it embodies the elementary principles, proper drainage, crowning, and as far as possible, uniform grading, and a systematic application of material, it will meet requirements.

Special provision is not being made for Government inspection. The certificate of the county commissioner or engineer as to the completion of the work will be accepted as to the manner of doing the work and expenditure of money. It is desired that the services of the Public Works Department in this respect will be advisory rather than that of inspection. Any consultation or assistance of this nature rendered by the Department will be without expense to the municipalities.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

LAYING OUT TOWN SITES.

BY H. DEQ. SEWELL.

The subject for this paper suggested itself from my having occasion during the past year to lay out several town sites and also from observations as to the methods adopted in the survey of other town sites that I have come across. In connection with the latter, I may allude to one not fifty miles from Toronto, where, after retracing some old lots on a somewhat complicated sub-division, I remarked to an elderly inhabitant who had passed most of his life in that vicinity, that there were considerable differences between my measurements and those shown on the sub-division plan. In explanation I received the following reply:

"You see, sir, the Surveyor (he was one of the best there is), when he made the last survey, looked all over, but he could not find any posts except in the cemetery."

"Well, Tommy, what had that to do with it?" I asked.

Tommy seemed somewhat surprised at my query, but condescended to explain that the people of the village were partly Methodists and partly Baptists, and that when they retired to the cemetery, "them Baptists was always trying to get the others to the river," which the latter as vigorously objected to, "so, you see, sir, them lots is sometimes in one place, and sometimes in another."

However, as several days later I noticed that some of my posts were missing, I wondered whether "them Baptists" from the cemetery had displaced them, or whether someone else of a more material nature had removed them. Of course, as a stranger in those parts, I could not reasonably be expected to know everything. Still, I felt that I could safely come to the conclusion that whenever one has to depend upon the good will of the past inhabitants of a town or village, it would appear to be a matter of slight importance whether the sub-division lots are carefully laid out or not.

In laying out a town site, the primary questions that present themselves to a Surveyor are as follows:

1. What degree of accuracy is required?

2. What designs are most desirable?

3. What are the best and most expeditious methods for conducting the survey?

Firstly, with regard to the first question—What degree of accuracy is required?

This is one which depends largely on the amount paid for the survey and also the value of the land.

If the land is valuable it is to be presumed that the owners will naturally require a careful, accurate survey, and consequently they should be prepared to pay for the work accordingly. On the other hand, if the land is cheap and has only a prospective value (largely in the owners' minds) the Surveyor can hardly expect a very large remuneration for his labor. Consequently, he requires to take into his most serious consideration, what degree or degrees of accuracy will be the most conducive to his pocket. Some Surveyors may have larger or smaller pockets than others, but all require them to be filled, and provided this most essential condition has been satisfactorily disposed of to the mutual satisfaction of all parties concerned, all that remains is for the Surveyor to make the sub-division with the greatest accuracy that the circumstances will permit of.

Secondly, what designs are the most desirable?

Where it is possible always insist upon the greatest possible simplicity and uniformity. If, as is generally the case, the Surveyor does the work by contract, try to impress the owners with the desirability of laying out the plot in simple tiers, or blocks, with the lots fifty feet wide. Sometimes the owners will tell you that they would prefer twenty-five foot lots; this is a serious difficulty, but can often be overcome if you insist upon a higher proportional payment on a frontage basis for twenty-five foot lots, partly to cover your extra work, also the labor imposed upon your men in cutting and shaping the extra posts in the adjoining bush. Sometimes the owners claim that they can sell a twenty-five foot lot more readily than a fifty foot lot, but you can point out that they can just as easily sell the east or west half, or the north or south half of a lot. Thus in getting fifty foot lots they can always sell half lots, or twenty-five feet, if they find it to their advantage to do so; besides, some pur-

chasers prefer fifty foot lots. Having got over this difficulty, the next is to object vigorously against park lots, market squares, parks, church sites, and all large areas that result in a reduction of the number of lots and consequently in financial loss, both to the owners and yourself.

Thirdly, what are the best and most expeditious methods for conducting the survey?

These are palpably whatever methods will ensure the least possible work on your part. Most Surveyors usually have some pet methods of their own, and almost every town site has its own peculiarities that may or may not necessitate variations, but usually, if you can determine two adjoining boundaries you are pretty safe in starting the sub-division work with a reasonable expectation of being able to pick up the other lines later on, when you get to them. I usually find in bush sub-divisions an advantage in running a line along the side of every alternate cross street and then picketing in the lots on the front streets, that is, along the front of the lots. This I generally find is the most economical method that can be adopted, as well as fairly accurate. But of course this can only be done where you have a fairly uniform town site to lay out. The only alternative when the town site is not uniform is to charge a much higher price for your work, but then there is a chance that someone else may get the contract.

Lastly, always try and save your men all unnecessary work; you have to pay for their services, and at the best you can only get a certain amount of work out of them, so if work is done in one way, it will not show up in another, and remember, that whenever you can save labor it is money in your pocket to do so. If your work is scattered, employ all your labor on the ground; it saves railway fares and hotel board; also, do not be afraid to take an axe yourself—it does the men good to see that the boss is not afraid of a little work, and helps to get more work out of them.

DISCUSSION.

Mr. Whitson—How do you decide whether property will be valuable or not? Land in the City of Toronto was not very valuable when it was first staked out.

Mr. Sewell—You get the idea of the owner and you know whether he is willing to pay for the work. In Toronto one, two or three inches make a material difference and you have to go over your survey very carefully to secure accuracy.

Mr. Whitson—I think Mr. Sewell's paper should not be published, as it might give a wrong impression.

Mr. Tyrrell—If land is not worth sub-dividing accurately and properly, I think it is not worth while dividing it at all. A Surveyor when engaged must do his work within the Act.

Mr. Sewell—It is within the provisions of the Act. All the Department requires is that the Surveyor should return the work as he did it.

Mr. Kirkpatrick—I disagree with Mr. Sewell when he says he objects to laying out park sites. We are suffering in Toronto from lack of park sites. I think in the twentieth century we ought to have a park in every town plot that is sub-divided.

Mr. Niven—My idea, Mr. Chairman, is that if a Surveyor is called upon to lay out a town plot he should do it accurately. If people will not pay for it I would not do it.

Mr. James—If the Surveyor did that in some cases he would not get the work. In Toronto a Surveyor has generally to do his work by contract. They won't pay you by the day. You have to make a contract if it is only to lay out one lot. You cannot get out of it. I have repeatedly made surveys in Toronto, upon which, in order to do the work correctly, I have spent, I suppose, five times the length of time that I have been paid for. I would not do it at all unless I did it correctly, and if one makes a contract he is obliged just simply to lose his time and not get anything for it. That is the position surveying in Toronto is in, according to my experience of it, and I have been thirty-five years here.

Mr. Dickson—I think the duty of the Surveyor is defined by the Act, and his work has to answer the requirements of the Act. If a man goes to lay out a town plot he shows lots of certain dimensions upon it, and when people purchase lots they buy on the supposition that the lines are correct. If a man says he does not want a correct plan it is the Surveyor's duty to say that he will not do the work.

Mr. Speight—In a city in laying out a block of lots it is done by the day. We used to be paid $5 and $6 for staking out a

single lot, and we had sometimes to spend two or three days over it. The public now regards $7 as a proper charge.

Mr. Abrey—I agree that the impression conveyed by the paper is wrong. If we as Surveyors undertake to do work, the question of pay has nothing to do with it. We are to do the work to the best of our ability, and to show the public that we are doing our work correctly.

I am now following a man with whose measurements I cannot agree, and I do not think anybody else can. I use a steel band chain, and he used an old iron link chain. Yet the public swear by him and believe that he did his work right.

There is another thing, on those plans shown by Mr. Sewell, that I object to, that is, the numbering of the lots.

Mr. Speight—Commence somewhere—anywhere you choose—in your plot, begin with number one if you like, and carry your numbers consecutively through to the end. You can number your blocks by letters or in any other way you like afterwards for better description, but it will not be so confusing in the Registrar's books if you register your lots with consecutive numbers, and there will be no long descriptions and no duplicates. It will save trouble for those who follow you.

Mr. Dickson—Let a Surveyor in all cases stand simply as an arbitrator between the private individual and the public. The law directs that he must lay out his concessions or side lines in a certain way, and he must show on his plan the size and the bearing of every lot, and I cannot see how possibly any man can justify himself if he says that he will make a survey according to what he was paid for. He must say, "I am sworn to comply with the law, and unless you want it correctly done I cannot do it; I may die some day and then difficulties may come up." If the survey is improperly made who would suffer for the inaccuracy? Not the man who made the survey, but the public.

Mr. Whitson—If the work has to be done properly somebody will be found to do it.

Mr. Tyrrell—I do not believe it is necessary either to stay in bed or to humbug the public. I know in my practice I try and do neither and I believe I succeed fairly well. To make use of a personal incident which took place only last week, I was engaged to make a survey in the town of Dundas and was told to do the work carefully and of course to go to as little expense as possible—that was understood. After making all possible searches in

the Registry Office, and in the Crown Lands Offices, and in lawyers' offices. I found myself absolutely without the information necessary to make the survey, and I so reported to the town authorities and enclosed my account for nothing done. I did not feel at liberty to make the survey when I would not feel able to go into the witness box and swear to its accuracy, and consequently I declined to make it at all. Where I have been unable to locate a point or a line to my own satisfaction, I have frequently plainly told the parties so and declined to put them to expense for the sake of making a five-dollar bill out of a client.

Mr. James—I believe all work should be done accurately. If undertaken at all do it accurately. But there are some things in connection with our dealings with the public and in the making of contracts that a Surveyor has to manoeuvre in some way to get over difficulties. You have either to do so or the party would probably go to some other Surveyor and get him to do the work. So far as the Surveyor is concerned he is to be guided by the Act, and I would follow that always.

I have had some experience in laying out town plots in connection with some companies in which I have been interested. They always take exception to laying out blocks and then lots numbered in each block. Lanes, I believe, are very objectionable. If the lots were numbered right through there would not be the block numbers in the conveyance.

Mr. Dickson—I think the block system is all a matter of opinion. I do not like it at all. I would like to see the lots all laid out on streets and numbered without regard to the blocks. But I think it is wise to lay out lots with a lane in the rear, so that people may get in from one end of the block to the other without having to drive in from the front of the lots.

Mr. Bowman—Mr. Sewell has given us a paper that has brought out a lot of discussion, and although the paper was not very extensive, a number of points were brought up, and I think it would be a pity that we should decide not to publish it. We might have it revised a little. No doubt Mr. Sewell did not mean that the dollars and cents standpoint was to influence the accuracy of the Surveyor's work, although possibly his language might give the general public that impression.

It seems to me that the completeness of the survey and the number of posts you plant depend upon the probability of the town site ever being built upon. It would be absurd to go and

plant posts at all the corners of all the lots out in a wilderness that may not have a house on it in a hundred years, because the posts would be rotten before the lots would be used; or if you put posts in a field which is going to be plowed over perhaps the next year, every post would be wrenched out.

Mr. Sewell probably meant that it was sufficient to outline the survey by planting posts on some of the principal streets at the fronts of the lots, and not to plant the posts at the rear ends of the lots at all, and I think that principle is sound. It does not affect the accuracy of the survey.

When I read the title for Mr. Sewell's paper I thought it was probably going to deal with town sites laid out by the Government, as was done in the old parts of Ontario. I suppose that is still the practice of the Department, and if so there are instructions to follow. But Mr. Sewell seems to have taken up large surveys for private individuals. The name "town sites" is rather a misnomer in this case, as it is rather a sub-division survey for private individuals. Then, a Surveyor has only to be guided by general principles, with no particular instructions. He has to be as accurate as his ordinary instruments will admit of in a reasonable amount of time; and those who have done a good deal of sub-dividing know that they were influenced sometimes by the locality in which the survey was being made. You are necessarily influenced by the natural features of the ground upon which the work is being done. In sub-dividing a farm in the outskirts of Toronto on level ground, steel tapes would be tolerably accurate, but taking those steel tapes and getting into the rocks and dense forest growth of Northern Ontario or New Ontario, one would not attain the same degree of accuracy in the same time or in double the time. It seems to me that if we take that meaning from Mr. Sewell's paper, the principle he enunciates is all right. It is not that everything depends upon the dollars and cents.

It would be a great improvement if a clause were put into the Registry Act requiring all plans of sub-divisions to have the lots numbered from one up consecutively, and to have no blocks nor park lots nor anything of that kind put upon the plan. Then you would simply refer to lot number so and so on plan number so and so in the registry office for a certain county, and there could be no mistake. The Registrar in opening up his abstract index would have a very simple matter to deal with, and there could be no confusion afterwards.

I have done a good deal of registry office work and know that conveyancers will mix matters very badly if any other system is used. They will get mixed on a block system, and they will get mixed in the system of having lot number so and so on the north or south side of a certain street. There will be entries of lots on the south side that are intended for lots on the north side, and so on.

The question of frontage of lots is a local matter for which we can lay down no hard and fast rule. In some towns the inhabitants have come to consider that a lot means a piece of land with a frontage of sixty-six feet, and you cannot force them to believe anything else, and they do not want anything else, and they are only satisfied with a lot of sixty-six feet front. In other towns lots are of fifty feet front. The Surveyor must give the people what they want.

In certain parts of the country lanes are looked upon as an abomination. Probably in some of the suburbs of Toronto lanes have been abused and have become dumping grounds; and they have other disadvantages, no doubt. But in other towns lanes are looked upon as a necessity. If owners want their land laid out in lots with lanes behind or between them, the Surveyor must do what is wanted. In my practice I have in some towns laid out lots of sixty-six feet front and in some of fifty-five feet front. In some towns I say, "Well, you don't want any lanes, of course?" and they say, "No." In another town I will say, "Well, of course you want a fifteen-foot lane between your lots?" and they say, "Oh, yes; of course," and I give them what they want.

Mr. Wilkie—Mr. Chairman, Mr. Dickson's idea is that the numbering of the lots should be consecutively along the east, west, north or south side of each street. I bumped up against a plan made by a man whose ideas were exactly in accord with Mr. Dickson's at Vankleek Hill. I found that a good number of the corner lots had two numbers, number so and so on one street and some other number on the other street. You do not always get lots fronting on parallel streets; sometimes they face on all four sides of the block, and then your corner lots must be numbered on both streets and so you have two numbers on the same lot. I feel like Mr. Bowman in regard to the size of the lots. When you are doing work for a man, laying out his property, making a sub-division of it into lots, you should make

the lots to suit the man who is having the work done. It is immaterial what size the lot is made. Make it to suit the owner, and make your plan accordingly. Do your work accurately and show it so.

As to the matter of posting, it is a question of how many posts you should put in. You have enough posts in, if you are able to sign the certificate. There are many old cases where the Surveyors have never put a post in the ground at all. I had a case in Vankleek Hill where a Surveyor laid out a plan and never planted a post. The owner laid off the lots with an old iron chain which was five inches too short. I found one house on two lots. I used a one hundred foot steel band chain, and he said my chain and my work were wrong. I proved to him that his chain was wrong and that that was the cause of all the trouble.

Captain Gamble—I saw a plan sent back the other day from the Master of Titles' Office at North Bay. They said they never again would allow the same numbers to recur, that all the numbers must be consecutive from one to ten thousand or whatever the number might be.

Mr. Kirkpatrick—I think, Mr. Chairman, that if we were to lay out a city all on one plan—which is not at all probable or likely—the difficulty would be to find numbers to suit all the lots. But in the present state of the public mind we are generally asked to lay out a small town site, or a town plot, as they used to be called.

The Government, as you know, has given up laying out town plots nowadays. They used formerly to lay them out and the streets were generally named after some of the political leaders of the day, and the lots were posted on each side of these streets a chain wide. I think the Surveyors were supposed to run along the front of each side of the street—I know that this is what they did in some instances; by that means they could arrange their posts absolutely accurately. Of course if they run them as they do in the old Muskoka system of townships and just lay off each lot fifty links from the center line, it possibly will be found that the lots are not exactly opposite to one another when you come down to inches, but my idea now is, that practically Surveyors have to be guided, as Captain Gamble says, by the Master of Titles. The best way is to know what the Master of Titles wants and then carry out his views as nearly as possible, and that, I believe, is just what Captain Gamble has

said, to number the lots from number one right straight through to the end of the survey. There is no difficulty about it, because men are not asked to survey a very large block of land. A lot is recorded as lot number so and so of such a survey, by such a Surveyor, of such a date, registered on such a date. Then the man who comes on next year does not begin where the last survey left off, but he numbers afresh on a plan of his own or a sub-division of his own, so that there need be no very high numbering. If the numbers go up to say 200,000 it would be very difficult to mark the post. Up in Edmonton, where I was last summer, they followed out that system, I fancy, on account of the Land Titles Act, and they numbered them from one up, and that is the best way to do.

You remember the old-fashioned way of laying out towns. Any of you who have ever been to Goderich know that it was laid out on the plan of a spider's web. The streets radiated from a common center, which was to be the market-place. It ran out from lots almost nothing, until a mile away the lots were very wide. That was the system instituted by the Canada Company. The Government has not laid out a town for a great many years; I think the last one was Magnetawan.

Mr. Dickson—Dryden.

Mr. Kirkpatrick—Dryden was a very small piece of rather level land, and I think we laid that out with lots a chain wide, and had no lanes. Of course if you are laying out a town I think there ought to be lanes. As an example of it, you walk down University Street; there has been no lane laid out, and all the filth from the houses on the street is laid out under your nose as you pass along, whereas if there were a lane in the rear the garbage would be disposed of out of sight. When there are no lanes it necessitates the people carrying out their garbage and ashes on to the streets, which in summer is not at all a pleasant thing to see or to smell.

At one time it was thought that Michipicoten was going to be a very wonderful place and there were town sites laid out there, not by the Government, but under the permission of the Government, the Government reserving so many of the lots on each street, and so many were sold to the parties who purchased the land; I just forget how it was numbered.

Mr. Whitson—It was numbered consecutively all through, from number one.

Mr. Kirkpatrick—And the lots were laid out fifty feet wide?

Mr. Whitson—Fifty feet by one hundred and fifty.

Mr. James—Numbering either in blocks or on each side of the street is objectionable. Numbering from one up to any number in the one plan, it seems to me, will create the least confusion and be the least likely to lead to litigation.

Mr. Tyrrell—Mr. Chairman, the publication of Mr. Sewell's paper cannot do much harm if the discussion be also published with it.

Mr. Sewell—Re-write it if you wish to. I wanted to raise questions. In going through town sites I have found a terrible amount of inaccuracy and I wanted to find out if some persons would own it.

The matter of sub-division is something for each one to do for himself.

Mr. Abrey—On a plan laid out not far away from the city I found some errors, and the Master of Titles sent for the Surveyors who laid out the plan and they had to make a new affidavit to the plan. They had to go out and see if there was an error and correct it.

Mr. James—With regard to registration, I understand some of the Registrars have taken exception to registering plans where a building is shown on any of the lots. I do not see why they should raise that objection. If the Act is such that it would not be correct to show a building upon a plan for registration, I think the law ought to be amended so that it could be done, because permanent buildings assist Surveyors in perpetuating points.

Mr. Kirkpatrick spoke of quite a serious objection, carting of garbage to the front street; but in my view that does not counteract a still more serious objection to lanes, especially if there is a public school in the neighborhood. If a person lives in a block where there is a lane he will find that during vacation gangs of boys will get into this lane and throw stones at the rear doors and commit all manner of nuisances beyond endurance, so that he will not have any peace either night or day. Thieves also can get into the rear of the premises, thus adding to the danger of houses being burglarized. I would rather any time cart the garbage out to the front than have the inconvenience of a lane to put the garbage in.

Mr. Dickson—As I have said, the numbering of the lots is merely a matter of opinion. I see the majority here is in favor of numbering consecutively, and I believe the majority should rule; we should all follow the same method.

Of course an owner has power to lay off his lots in any sizes he pleases, but as far as the numbering goes, I think the law should step in and say that it must be done in a certain manner so as to produce uniformity all through the country.

The Chairman—I am in favor of consecutive numbering. Lately I have adopted this system, and on one sub-division that I made last spring, in order to avoid the same number appearing twice on the same original lot, I started where another sub-division had left off and continued the numbering from where the other Surveyor had ended.

The only advantage that I see in numbering lots on the opposite sides of a street with the same number is that any Surveyor would know that a lot with a certain number would be in a certain position on such and such a street all through that system of survey, the same as the lots in a township.

From my experience I like lanes at the rear of the lots.

Mr. Dickson—I think, Mr. Chairman, this has been a very interesting discussion. A good deal has been said in favor of and against the lanes. On the whole, I am in favor of having lanes. I think a gentleman does not want his coal, wood or hay driven to his front door if he can help it.

There are some objectionable features in the paper, yet taking it in connection with the interesting discussion which has taken place, and which also should appear, the one will counteract the other, because the members have expressed their opinions. I would be in favor of the paper being published.

. . . . . .

Mr. Kirkpatrick—I wish to speak on a question of privilege. We were speaking yesterday on Mr. Sewell's paper on "Town Sites," and he stated to me that he had no absolute authority or power to enforce certain fixed rules for plans, but that he had in his experience found that it would be much better if Surveyors had a uniform system of numbering their lots not in blocks, but from one to the highest number that is required. I said, "Will you suggest that Surveyors should invariably color with a flat wash the lots that they sub-divide, leaving any other lots on the plan that were not divided uncolored, and color the roads and streets that they lay out brown, leaving other roads that they are

not interfering with uncolored?" And if they are sub-dividing a lot which has already been sub-divided, each new sub-division which is to take the place of the old, should have the old lines dotted in in blue. This would be a great help in our public offices.

Mr. Dickson—I think these remarks are very valuable.

Mr. Shaw—In the last six months I have had the pleasure of making plans over again because they were not sufficiently colored. The Deputy Registrar refuses to register a plan with the name of a village on it; he will not have a name at all unless it is incorporated.

Mr. Gibson—You allude to putting unincorporated villages down?

Mr. Shaw—Yes.

Mr. Dickson—I have never considered this before. We have a dozen villages in the county where I am that are not incorporated, and our plans are called "Plan of Village ———," being a sub-division of certain lots.

Mr. Whitson—Your district is not under the Land Titles Act.

Mr. Sewell—Is there any authority by which they can refuse?

Mr. Whitson—Have you registered any plans, Mr. Sewell?

Mr. Sewell—They were registered under the Land Titles Act. Here is a plan of the "Sub-division of part of lots thirteen and fourteen, concession one, township of Nipigon."

Major Sankey—What are you going to call that town?

Mr. Sewell—They can call it Nipigon; I have it marked "Nipigon" in large letters.

The Chairman—That is the township.

Mr. Sewell—Here is another plan of a place registered as Blind River, and they wanted "Blind River" on it; so I put it "Plan of sub-division of part of the south half of lot twelve, concession one, township of Striker, Blind River."

The Chairman—It has no village or town.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

NOTES FROM AN EXPLORER'S DIARY.

BY J. W. TYRRELL.

About the first of July, 1882, a "Government picnic party" assembled at Penetanguishene under the leadership of a veteran of the order of the chain and compass. He was supported by your humble servant as assistant, two post-office clerks as chainmen, and a cook, besides a number of Indian packers and axemen. The place allotted to us for our picnic was a park six miles square in the swamps a few miles to the northwest of Lake Nipissing, in New Ontario, and thither we wended our way.

By the aid of a small tug-boat we easily procured passage to Parry Sound; and thence to Nipissing, a further distance of seventy-five miles, wagons were used for the transport of supplies; but for ourselves, well, "we just watched our chances and walked!" and those first days in the woods, with black flies and mosquitos at their best, are memorable ones for me. I have clearer visions to-day than I had then, of a youth fresh from college groping along the trail which he could hardly see on account of inflamed and swollen eyes; for my first night in the woods furnished one of the most festive occasions which the festive mosquito of those parts has ever known. My slumbers were so sound that I was all unconscious of the insects' banquet until aroused by that call which still haunts me—"Hurrah boys!" Then to my distress, but the great amusement of our Indians, I found that my face was swollen to about twice its natural size and that my eyes were completely closed up. This discomfort, however, soon became useful as a diversion from sensations of crippled shins and blistered feet. But in due time all hands reached Nipissing—the end of the "tote" road, and thence we proceeded by boat and canoe to the west end of the lake, and some miles up the La Vere River. We had now reached the vicinity of our picnic grounds, so landed our goods and proceeded to pack them back a distance of eighteen miles through the swamps, to a post on Salter's Line.

I might mention that previous to this time, some members of our party had failed to show their appreciation of our outing in

various ways; but our first day in the tump lines, wading through swamps under a pouring rain, crawling through thickets and clambering over wind-falls, brought the climax for them.

I often look back to that day in a rain-soaked Nipissing swamp as an initial point in my life, and I am sure that those of my comrades who still survive will not have forgotten the experience.

One of the rules of camp was that every man must pack his own dunnage, and whilst the Indians were jogging along with as much of our outfit as they could conveniently carry at one time, the rest of us, uninitiated, were struggling along in the rear as best we could with our little packs—becoming farther and farther behind as the day advanced. Many were the mishaps and miseries of that day, but one will suffice to relate.

Our party was strung out in single file for a mile or more in a dense, wet swamp, and your humble servant occupied about third to last place in the string. As I was struggling desperately along—not relishing the sensation of being left alone in that solitary dark swamp, there came to my ears distinct but distant sounds as of someone in distress. Resting my pack upon a log, I stopped to try and make out the cause and direction of the noise. It was not "repeated," but rather came as one continuous cry or howl, such as might be emitted from some wild animal caught in a trap. Locating the direction of the noise, which was directly behind me, I left my pack on the log and retraced my steps. As I drew nearer, I could recognize the voice as that of ———, one of the chainmen, late of the Post-office Department, but could see no person. Drawing sufficiently near, I called out "Where are you?" and received the prompt and most feeling reply, "Here, in hell and perdition." Following the direction of the voice, I was led to a small wind-fall, where I found my companion suspended in the brush by his tump line—he having slipped through and his pack remaining on top.

Our first night in the swamp was less comfortable than it might have been, since through some mismanagement our tents had been left behind at the lakeshore, and we had only our blankets to protect us from a drenching rain—which continued all afternoon and half of the night. It was with much difficulty that a sufficient fire was kindled to make a kettle of tea, and no attempt was made to prepare any hot supper, for the cook, as well as most of the party, was very much disgruntled. The

next morning one chainman and the cook, accompanied by two Indians, started for home, having become abundantly satisfied with their picnic. I well remember the emphatic though inelegant farewell declaration made by the chainman as he was leaving us. It was that before he would be found on a survey party again, he would peck ———— with the hens. For the rest of the season, we got along quite well, filling the places of the deserters by two Indians. Our picnic fare was plain and good—though it might not be termed luxurious, or even most suitable by some of us. As nearly as I can recollect, the following list represents our supplies: Flour, mess pork, bacon and beans, dried apples, rice and tea. We had a small quantity of sugar, for Sundays only. We had no butter; but I have seldom eaten any that has tasted so good as the fat from that mess pork which we plastered upon our bread. And those beans—baked by our fat Indian cook in a bake kettle—I can almost taste them now.

Still, as a matter of expedience, I now believe that our fare of those days—good as it may have tasted—might have been improved upon. With me, at least, it did not seem to entirely agree, as one of the first effects was to cause me to break out all over with great angry boils. I had seven of them in full volcanic eruption at one time, several being on my lower limbs, where they received many a vicious prod from the sharp, newly-cut snags on our lines.

However, despite a few of such discomforts, this my first "Government picnic" was a success, and ended more pleasantly than it had begun. I returned home in the autumn ten pounds heavier than when I had set out.

. . . . . .

Here, in order that I may not be too lengthy, we will suppose the curtain to have fallen, and eighteen years to have rolled by, ere it again lifts and discloses further picnic experiences of the year 1900, when the writer made a journey to Great Slave Lake, and thence to Hudson Bay and return, covering in all a distance of 4,600 miles. Our journeys out, as well as homeward, were made during the winters, by means of dog sleds and snowshoes, and the whole of the summer season was utilized for exploratory work, which was chiefly carried on in canoes.

Sled travel over the ice of Great Slave and Artillery Lakes was continued until the 8th of June; but by that time it had become

hazardous, and we were obliged to delay further progress until we might be able to proceed with our canoes—which we did on the 18th of the same month. There was thus only an interval of ten days between our winter and summer modes of travel.

Up to this time, commencing at Old Fort Reliance, the ruins of the headquarters of Sir George Back in the years of 1832-3-4, we had made a compass and pedometer survey of the country for some miles on either side of our portage route, whilst our voyageurs were occupied with the transport of outfit and supplies, and in this way a very considerable area of the "divide" country in the vicinity of the east end of Great Slave Lake was explored and mapped—the old maps made by Sir George Back being found to be most inaccurate and misleading. In fact, we found some of his map-work and descriptions to be so amazingly exaggerated and unreliable that with our party the term "Backite" became a synonym for falsehood.

I have often thought, since reading Back's book and going over portions of his stamping grounds, that if knighthood was conferred upon him because of his published narrative and maps, he did certainly earn the distinction—as a writer of fiction rather than a recorder of facts.

Just one example to show you my grounds for this severe criticism! Old Fort Reliance, the place where Back and his party spent two winters, was built on one of the beautiful terraces at the mouth of the Lockhart River, where it discharges into the north-eastern extremity of Great Slave Lake, and upon this river there occur a number of beautiful waterfalls—the highest and most beautiful of which was named by Back, Parry's Falls, and is described by him in the following words:

"From the only point at which the greater part of it was visible, we could distinguish the river coming sharp round a rock and falling into an upper basin almost concealed by intervening rocks, whence it broke in one vast sheet into a chasm between four and five hundred feet deep, yet in appearance so narrow that we fancied we could almost step across it. Out of this the spray rose in misty columns several hundred feet above our heads, but as it was impossible to see the main fall from the side on which we were, in the following spring I paid a second visit to it, approaching from the western bank. The road to it, which I traveled on snowshoes, was fatiguing in the extreme, and scarcely less dangerous, for to say nothing of the steep

ascents, fissures in the rocks, and deep snow in the valleys, we had sometimes to creep along the narrow shelves or precipices, slippery with the frozen mist that fell on them. But it was a sight which well repaid any risk. The whole face of the rocks forming the chasm was entirely coated with blue, green and white ice, in thousands of pendant icicles, and there were, moreover, caverns, fissures, and overhanging ledges in all imaginable variety of forms so curious and beautiful as to surpass anything of which I had ever heard or read.

"The immediate approach was extremely hazardous, nor could we obtain a perfect view of the lower fall, in consequence of the projection of the western cliffs.

"At the lowest position which we were able to attain, we were still more than one hundred feet above the level of the bed of the river beneath, and this instead of being narrow enough to step across, as it had seemed from the opposite height, was found to be at least two hundred feet wide.

"The color of the water varied from a very light to a very dark green, and the spray, which spread a dimness above, was thrown up in clouds of light gray.

"Niagara, Wilberforce Falls in Hood's River, the Falls of Kakabikka, near Lake Superior, the Swiss or Italian falls, although they may each 'charm the eye with dread,' are not to be compared to this for splendor of effect.

"It was the most imposing spectacle I had ever witnessed, and as the berg-like appearance brought to mind associations of another scene, I bestowed upon it the name of our celebrated navigator, Sir Edward Parry, and called it Parry's Falls."

Now, after reading the above fine description by Back, I fully expected to see something extraordinary when I should visit these falls and was a little disappointed one day when my assistant—C. C. Fairchild, O.L.S.—returned from making a track survey of the Lockhart and reported that the famed Parry's Falls were a myth and had no existence. He had been up the river eleven or twelve miles, and had passed two or three small falls of no particular note, but had seen no Parry's Falls. They were reported by Back to be about six miles up the river, so I could not understand the discrepancy of reports, but concluded to go up next day and see for myself, which I did, being accompanied by Mr. Fairchild and Bishop Lofthouse, who was also a member of my party. At about six miles from the mouth

of the river, sure enough we found Parry's Falls—but I did not blame Fairchild for failing to recognize them. There was sufficient truth in Back's description to enable one to identify them as the same to which he referred; but his statements as to dimensions are too far from facts to be allowed to stand on record unchallenged. Happily for Back he was not expected to produce photographic views to mar his beautiful word pictures, and so his discoveries were immensely more wonderful than ours. I obtained half a dozen photos of Parry's Falls, as well as actual measurements of their dimensions, which are as follows: Total fall from top to foot of lower rapid, eighty-five feet (instead of from 400 to 500), and width at crest of fall, thirty feet (instead of 200), though at higher stages of water the width might possibly be increased to fifty feet. Excepting as to the dimensions, Back's description is not so far from the truth, as the falls are certainly very beautiful. At the time of my visit, on the 15th of May, they were completely bridged over with ice, so that we were enabled to walk over the very crest of the fall, and obtain views from every available position.

I am sorry to have to thus challenge the report of so renowned an explorer as Sir George, but such we found to be the facts; and further, we found our Indian sketches to be more accurate than the published maps of this surveyed route. A resurvey of the Back River would, therefore, seem to be in order at any time.

As to our methods of survey: It has been suggested to me that a brief account would be of interest to some members of our profession.

Of course, we did not pretend to make an accurate survey of the country, or even our route through it—such as one would make with transit and steel tape—as we covered from twenty to fifty miles per day; but we did undertake to make a good track survey approximating accuracy sufficiently so that anyone taking our map as a guide would have no difficulty in traveling by it. Being provided with a good Hadley sextant and artificial horizon, and three chronometers, I fixed a large number of points on our route in latitude and longitude; and then, by means of a solar compass, magnetic compasses, canoe logs and pedometers, we carried on our survey and fitted it in between these fixed points, so that no part of the survey is very far out in geographical position, and the detail work is practically correct.

The following is an exact copy of one page of my note book, and will be very easily understood upon perusal:

STA.	COURSE.	LOG.	TIME.	CURRENT.	MLS.	BAR.	NOTES.
			h.m.				
477	57°	58.70	7.00	3⅓	0.0	29.13	Camp and Cache. Mag. Var. 32° E.
478	67°	59.5	7.12	3	1.4	.....	Sandy Shores and Bottom.
479	317°	60.4	7.27	3	1.65	.....	
480	66°	60.7	7.34	2	.5	.....	5 ft. Deep, ¼ Mile Wide.
481	27°	61.65	7.47 / 8.02	2	1 4	.....	Shot Deer.
482	92°	62.70	8 19	3	1 7	.....	Spruce Groves on both sides of River. East Channel the deepest.
483	2°	63.2	8.26	3	.85	.....	
A	.....	.....	.....	.....	.....	.....	Sounded across River and found 14 ft. of Water.
484	14°	64.7	8.50	2½	2 5	.....	
485	342°	66.1	9.10	2½	2.2	.....	Striæ on Mountain North Ast.
486	17°	66.4	9.16	3	.6	.....	Sandstone Hills.
487	87°	68.0	9.40	2½	2.4	.....	
488	6.4°	68.8	9.50 / 11.25	2½	1 2	.....	Shot 9 Musk Oxen.
489	9°	69.1	11.32	2½	.6	.....	3 ft. Deep on Shoal, ⅜ mile Wide.
490	347°	69.5	11.40	2	.65	.....	Sand Shoals, but Channel.
491	43°	70.1	11.46 / 12.58	2	.8	.....	Lat. Observation.
492	122°	72.0	1.25	2	2.7	.....	Musk Oxen.
493	163°	72.7	1.35	2½	1 1	.....	
494	172°	73.0	1.40	2½	.5	.....	
495	132°	73.6	1.49	2½	1 0	.....	Depth of Channel, 11 ft.
496	57°	74.0	1.55	2½	.6	.....	Water Shallow, 4 ft.
					24 35		

The first column, headed "Station," gives the number of the stations or points in consecutive order at which the various instrumental readings were taken.

The second column gives the bearings—taken as a rule with a prismatic compass—of the various courses in the survey from station to station.

The third column—headed "Log"—contains the record of the consecutive log readings at the various points.

The fourth column contains a record of the instant of time when the log readings were taken, so that the proper correc-

tions can be applied on account of currents, or for otherwise enabling one to estimate distances traveled.

The fifth column contains the estimated rate of current at the different points of observation; and the sixth contains the tabulated mileage from station to station, reduced from log readings, time, and rate of currents.

The seventh column is intended to contain a record of barometer readings—which were more particularly noted where rapids or falls were met with.

In the last column a general memorandum was kept of all passing objects of interest, and miscellaneous notes; such as measurements of the depth or width of river, the observed magnetic variation or meetings with musk oxen.

. . . . . .

Perhaps just here a description of our first encounter with these animals would be of interest.

It was the 27th of June, and our party had crossed the height of land through a succession of small lakes, and was following the descent of a small stream, or rather a chain of lakes connected by short stretches of current, towards the east and north-east. We had entered one of these lakes—which I have named after the present Minister of the Interior of Canada—and were steering our little fleet of Peterboroughs northward under full sail, when the wind became so strong that we were unable to weather it even under shortened canvas, so with some difficulty we made a safe landing upon a long point extending northward from the south shore. Here camp was pitched, for it was already evening—though quite light—for the latitude was 63° 44′ north.

Excepting for the high wind, the evening was a delightful one, so that whilst camp was being made, Fairchild and I slung our field glasses and prismatics over our shoulders and struck off up the shore towards a conspicuous high sand ridge, where we hoped to obtain a good view of the lake, and if possible, ascertain our future course—for upon entering any lake this was always a problem to be worked out.

The evening being agreeably cool and free from mosquito music, we much enjoyed the stroll over the mossy hills, and upon reaching our objective point—some two miles from camp—seated ourselves upon the crest of the ridge and proceeded to sweep the lake and its deeply indented shores with our powerful

glasses. We had not gone so far as to note any bearings, when there fell within the limited disc of my vision some dark moving specks away on the north shore. An instant's scrutiny convinced me that they were musk oxen, though we had not expected to meet with these animals for some time yet. Yes, they were certainly musk oxen, as their appearance and movements were quite different from deer—but whatever they might be, a more intimate acquaintance with them was immediately desirable, as we were quite out of fresh meat and reducing our very limited stock of bacon.

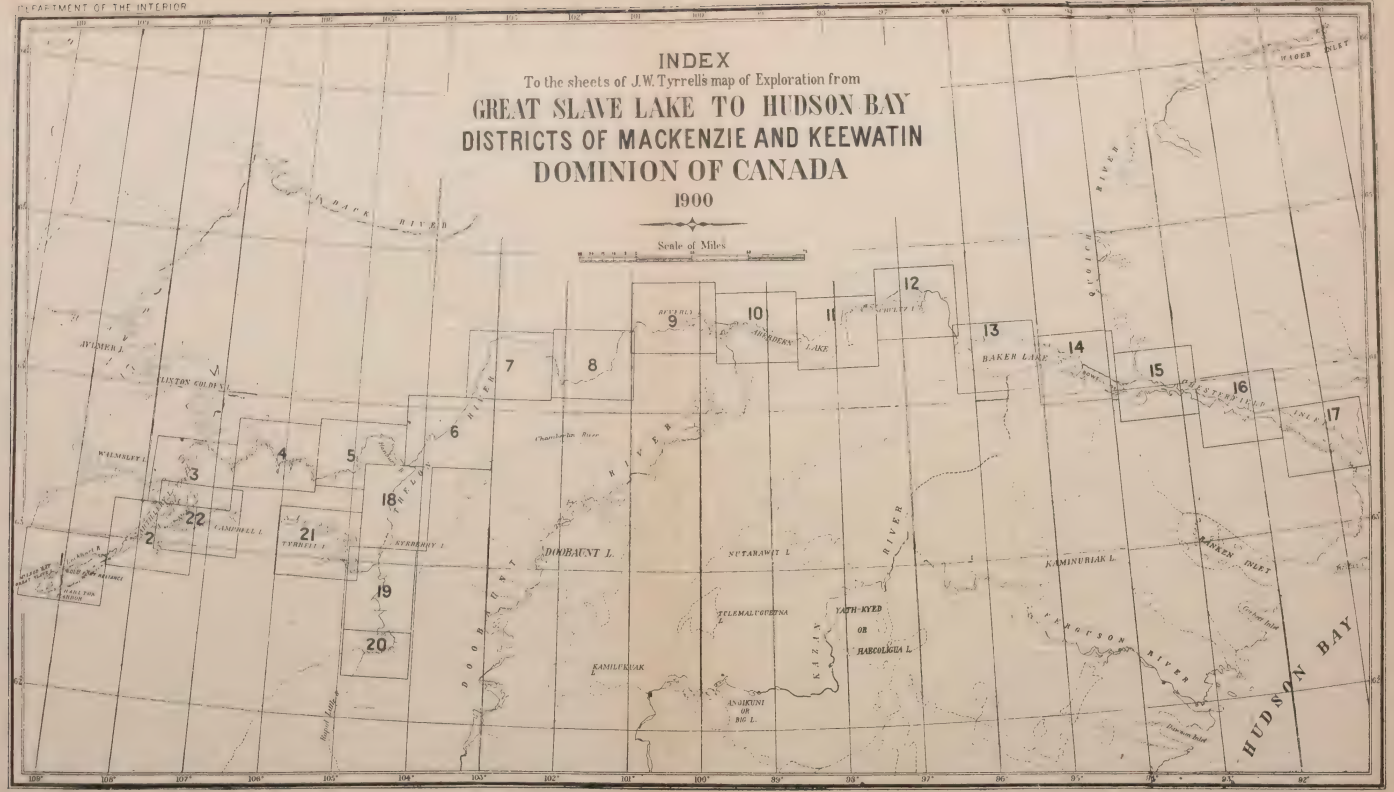
We had no rifles with us, nor had we canoes to cross the lake, but a quiet hunt was decided upon, and we returned to camp to prepare ourselves for it.

Arriving at camp—the hour now being 10 p.m.—we found the tent empty, our two companions, the bishop and cook, having gone off picking berries. At this we were not disappointed, feeling that two rifles would likely be more effective than four, so we provided ourselves with two .303 Winchester repeaters and a supply of cartridges and were about to launch one of the canoes when two of the Indians, noticing our movements, and anticipating our object, stepped to the shore and saved us the trouble. As we took our places in the middle of the canoe the Indians took charge at bow and stern, and in a moment, with scarcely a word spoken, or the least noise save the slight splash of the canoe in the water, we were off. Our steersman then whispered, "You see deer?" to which I replied, "Strange big black deer," the meaning of which he quite understood; and I directed him to a point about three miles distant on the opposite shore. The lake, which a few hours before had been whipped into foam, was now like a sheet of glass, and the sun had just disappeared below the northern horizon, leaving the firmament one gorgeous glow of ruddy light. It was a glorious sub-Arctic night, and as we sped swiftly but noiselessly through the water towards the long shadow of a dark hill, where we expected to land, the whole environment was to me most enchanting, almost to intoxication.

In less than an hour we had gained the shore, and hauled out the canoe on a sand beach at the foot of an abrupt high bank. We were now in perfect concealment from our enemy and to leeward of them, so proceeded to climb the steep bank to the plateau where they were feeding.

Between Fairchild and myself honors were about even, as we were each responsible for the lives of four monarchs of the plain.

We certainly now had an abundance of fresh meat, such as it was, and the Indians were set to work to remove the hides, cut out the tongues and save any other portion of the carcasses that might be desirable. Meanwhile Fairchild and I returned to camp, where we found all hands in the land of slumber.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Nearing the top, we found ourselves much out of breath and unsteady, so lay down at full length for a time, until we had recovered our wind and nerve. Then crawling up the bottom of a little valley a short distance further, brought us to the crest of the hill, from which vantage place we came within full view, at ranges of from only sixty to one hundred yards, of the huge dark forms of nine musk oxen.

They were browsing upon the grass and all unconscious of our presence until "crack" went our two rifles at the same instant, and two of the foremost bulls commenced to stagger and tear madly about, whilst the others were thrown into wild confusion and galloped hither and thither, not knowing which way to flee.

Several more bullets were required to bring the wounded bulls to earth, and as we were administering these from our concealment, the remainder of the band, seemingly having located us, made a furious charge straight for our position. Springing to our feet, for things had now become exciting, we met the furies with so deadly a volley that two more were sent to earth and other four so crippled as to check their charge.

One young one only escaped unhurt, and he was allowed to go, whilst we completed our act of slaughter upon the wounded animals; nor was this easily accomplished, for they put up a desperate resistance, making several frenzied charges upon us before they were completely overcome.

One huge old bull seemed to defy the power of my lead in a most astonishing manner, for bullet after bullet was sent ringing through his carcass with apparently little effect, but at length he, too, swayed, staggered and came to earth. In skinning and cutting up his carcass, I examined his wounds and found that three bullets had pierced his heart before he had fallen.

During the excitement of the battle we had paid little attention to the movements of our Indians, other than to notice that they kept close to our heels.

Between Fairchild and myself honors were about even, as we were each responsible for the lives of four monarchs of the plain.

We certainly now had an abundance of fresh meat, such as it was, and the Indians were set to work to remove the hides, cut out the tongues and save any other portion of the carcasses that might be desirable. Meanwhile Fairchild and I returned to camp, where we found all hands in the land of slumber.

Two or three yells soon caused everyone to turn out, and orders were given to move camp across the lake. I explained briefly that we had a quantity of fresh meat on the other side, where two of our men were already caring for it; so somewhat reluctantly, for it was now twelve o'clock at night, the move was made to a beautiful spot at the base of "Musk Ox Hill."

Those of our companions who had not taken part in the hunt, upon hearing of our experiences, expressed grievous disappointment because of missing the sport, so we tried to comfort them by the assurance that we had not slain the whole band, and that they might yet come in for their share. We told them of seeing one young bull go off in a certain direction, so the bishop and Acres armed themselves with Winchesters and set out for blood, and they had not long to wait, for the young musk ox, no doubt looking for its dead comrades, suddenly appeared around a bluff, and let such a roar out of him as to almost freeze the blood in one's veins. A fusilade followed, but away galloped the calf towards a long point extending into the lake. Thinking that we might now effect his capture, we all strung ourselves in a line across the base of the point and thus advanced abreast, thinking that we would be able to drive him into the water and there secure him; but the plan did not work out in that way. Mr. Musk Ox simply sized up the situation, selected his man—which happened to be Fairchild, who was armed only with his Eastman kodak—lowered his head and shot forward with the speed of a runaway locomotive. Fairchild also sized up the situation, and lowered his camera. He stood his ground until the little brute was within fifteen feet of him, when he snapped his camera, sprang to one side and so avoided trouble. If one had any doubts in his mind as to the young musk ox's intentions he had only to look—as I did—at the tracks of the beast and note how well they covered the spot where Fairchild had stood.

Having thus broken through our line, the fusilade was resumed by our riflemen, and so wildly did the bullets whistle about for a time that every man, acting the better part of valor, lay flat on the ground or sought the friendly shelter of some convenient boulder. Presently there was a cessation of firing, and in its stead there came from the valley below loud shouts for help and for more cartridges. Seeing the humorous side of the situation rather than any other, I hurried down with my large camera and found the young musk ox—who had received

a bullet through the neck and was bleeding freely—playing tag with Acres around a huge boulder. At times the pace around the rock was quite brisk, and once at least did I recognize the exclamation "get out, you brute," as rifle stock and musk ox head came into violent contact.

The hour of the night, or morning, as one may choose to call it, was half past one o'clock, but so good was the light that I was able to obtain a fairly good photo of the musk ox, though it is a matter of regret that my picture does not better represent the whole episode. The little beast was ultimately despatched by a knife in the hand of one of my Indians.

Immediately following this slaughter, two days were spent in drying meat for future use, and a fine lot did we cure, after which we proceeded with our survey to the great Thelon River, and down that stream to its confluence with the Doobaunt, which I had surveyed with my brother in 1893.

. . . . . .

From the confluence of the Doobaunt, on the morning of July 16th, Mr. Fairchild, with two canoes and party of five, set off for Hudson Bay, whilst I, with the one remaining canoe and two men, returned up the Thelon, with the intention of exploring the upper part of the river, and possibly getting through to Lake Athabasca, in which case I might be able to catch the last Hudson Bay Company steamer going up to the Landing, and get out earlier than Mr. Fairchild. However, this was all uncertain, as it was impossible for me to know what I should be able to do in these regards. At "Ping-a-wa-look's" camp on our way up stream, I procured the few moccasins they had for us, and they were much needed before we got out of the country, for as my men tracked the canoe up stream, the sharp rocks and stones over which they had to walk cut through two or three pairs of shoes a day.

The weather, which had turned rough about the middle of the month, continued so for two weeks, causing us some delay, and a more unpleasant trip up the river than we would otherwise have had.

In passing some of our former camping places, it was observed that the water of the river had fallen about two feet from its level of two weeks previously.

On the 28th, we reached our old camp at the Forks and there

remained for a day or two in order to get a rate for my chronometer as well as to dry some meat. On the last day of July, I turned my attention to the upper portion of the Thelon, which was found from the forks up to be obstructed in several places by shallow rapids. The general trend of this part of the river is southerly, and its banks, which are more thinly wooded than farther north, are comparatively low and sandy, with grassy flats at some places—particularly toward Eyeberry Lake, about fifty miles up. This lake was so named because of the abundance of eyeberries which we found on its shores and islands. About ten miles above, or south, of Eyeberry Lake, a small river fifty yards wide was observed emptying into the Thelon, and south of it the river banks became suddenly much higher, and the river channel more confined and tortuous.

Spruce and tamarac groves were also becoming more frequent, though still scanty enough. The average elevation of land was from fifty to eighty feet above the river, which in width varied from 100 to 250 yards, and in depth from two to six feet.

Its mean velocity was about three and one-half miles per hour. Flood water marks here, as well as on the lower part of the river, were observed as high as thirty feet above ordinary water level.

In August it was observed by Fairchild to be three feet higher.

At about ninety miles the country again becomes more open and prairie-like, with low, sandy river banks. A few miles further up, the banks are composed of coarse gravel, and rise to a height of eighty or ninety feet. The rock formation, which makes its appearance at several points along the river banks, was observed to be sandstone, and so on the general character of the river and country continued much the same for a distance of 128 miles, when the stream becomes divided again, and both branches rapid and shallow. At their confluence was also observed the junction of sandstone and granite rocks. It was now August 9th, and judging from my progress during the last two weeks, and the prospect of increased difficulties ahead, I came to the conclusion that it would be unwise to attempt to push through to Lake Athabasca—a probable distance of 500 miles further by my route. It seemed to me preferable that I should rather endeavor to explore a second route across the " Divide " to Artillery Lake, and recollecting the small river flowing in from the west at the Sixty

Mile, I determined to return thus far, ascend it as far as possible and thence cross by the easiest route to Artillery Lake.

Having decided upon the above plan of action, we easily returned down stream to my new point of commencement, and on the 13th began to ascend my west branch. Its course took me as nearly as could be in the direction of Artillery Lake, but I was not long to follow it, for by noon of the same day we had reached the head of navigation for so heavily loaded a canoe as ours. Not wishing to be thwarted in my object, I now decided to send my two men with the canoe around by the way we had come to Artillery Lake, and that I would walk across alone.

It seemed that there could be no great difficulty in doing so, for the distance in a straight line I knew to be only about eighty miles; the season was still early and there were now plenty of deer roving over the country. Thus viewing the problem, I sent my men back with the canoe and its contents, and having selected my necessary outfit for the tramp, bundled it up into a neat pack of about fifty pounds and started off. It did not feel heavy at first, and the weather being fine I made fair progress, but as the day wore on my pack became burdensome and by evening I was quite ready to lay it down and creep into my sleeping bag. This first day's march, which covered thirteen miles, was along the course of the stream, over rough hills of gneiss, sparingly wooded for a distance of ten miles only from the Thelon. At a point eight miles distant I discovered a beautiful little fall of fifty feet drop, and it was here that the gneiss formation was first noted. Its strike was observed to be north 15° east (astronomical) and dip 70° east.

My first day's march took me to the shore of a small lake, which of itself formed no serious obstruction to travel, but may be mentioned as the first link of a chain which was to cause trouble. The lake is about four miles long, but of very irregular shape. Its east shore is conspicuous because of a high ridge of white sand which has a bearing of south 63° east. Because of the irregularities of the shore and the impossibility of seeing any great distance ahead, it required a twelve mile tramp to get free from this lake, and that represented my second day's journey. My rations were obtained from the carcass of a deer which I had shot, and some biscuits which I had brought in my pack.

On the morning of my third day, only three miles from "my camp" I came upon a large lake—to which I have taken the

liberty of attaching my own name, since I am sure it has never been, and perhaps never will be, of as much interest to anyone else as it proved to me.

Ascending the highest convenient hill, I examined the lake as critically as possible with my fine field glasses. Its bearing lay nearly north-east and south-west. Its southerly shores appeared to be only five or six miles distant; but its northerly boundary I could not determine, being apparently limited only by the blue, hazy, distant hills. Having no boat or timber of any description with which to make a raft, I turned my steps toward the south, as the seemingly easiest way of getting past this obstacle, and for three miles or thereabouts I got along all right. Then I was suddenly confronted with a large stream forming the outlet of the lake. This I descended for some distance in the hope of finding a ford, but finding none, I stripped myself and waded in, hoping to find some place where I could get my outfit across, but in this I was disappointed, and the water, too, was very cold.

I had no alternative but to return and try the north end of the lake, which I did, and, to make a short story of a long, weary tramp, over rocky hills and through soft muskegs, ankle deep in water, after three days of coasting it, I reached the north-west angle of Tyrrell Lake, and there was no love lost in parting. I had now been five days on my tramp, but out of a distance of sixty-three miles covered, I had only made sixteen miles westerly out of a necessary eighty; and the contemplation of this was anything but encouraging, for I had counted on reaching Artillery Lake within ten days at the longest. There was, however, no possibility of rejoining my canoe now, so my only possible course was to push ahead regardless of what time the journey might take, or what new difficulties it might present.

The character of the country continued much the same, the rounded bare hills of gneiss being separated by wet muskegs, or as commonly, small lakes and ponds, which covered a large percentage of the country and formed a great impediment to travel.

The morning of my sixth day set in with a chilling north-east wind and pelting rain, which not only saturated my clothing, but also the moss, so that I could make no fire. Having a small flask of brandy with me I refreshed myself with a little of it in water and a biscuit, and tramped on, making thirteen miles during the day. The night being dark at this season, it was not possible

to travel continually, so, wet and shivering as I was, I lay down on the rocks in the pelting rain to try and sleep; but this was not to be, for my bed soon became a puddle of water, and I was uncomfortable indeed. I earnestly longed for the daylight, so that I might get up and travel, and at length it came, but still the cold rain came down, so that I could only wring out my single blanket and start on without breakfast. A deerskin which I had carried in addition to my blanket had become so water-soaked as to be too heavy to carry, and was left behind. Fortunately, by noon on the seventh day, the clouds broke and let the warming sunlight stream through upon me. Thus I was enabled to dry my clothes, and still better, ere long, to make a fire and cook some venison, which was much appreciated. At night as I went into camp (more properly my blanket), I shot a fine fat buck, and cooked as much of it as I could, with the little moss I could find.

The 20th of August was my eighth day out, and I had made only thirty-three miles of westing, but now the weather seemed to have cleared, so I pushed on with fresh courage, passing several small lakes and bringing up on the summit of a hill overlooking a larger one.

Here, observing the approach of a heavy storm, I proceeded to fortify myself as well as my blanket and canvas wrapper would admit of, and so fairly well weathered out a bad night. But the next day was intolerable. I endeavored to push on, but so cold and drenching was the rain that I shivered even as I traveled, under my water-soaked burden. Later in the day the weather became so thick that I was as one walking in the dark—not knowing what was before me—and soon found myself almost entirely surrounded by water. I was forced to await an improvement in the weather, and so, partaking of a wet biscuit, for I had nothing dry, and a drink of brandy, I lay down on the sand.

All night the cold rain came down in torrents, so that I was perfectly saturated with it. As the morning dawned conditions were not improved, for the rain had changed to snow and clothed the landscape in her chilling garment of white. It left me in an extremely uncomfortable condition, to say the least, being without shelter, fire or cooked food, but the worst seemed to have passed, for at eleven o'clock the next day the sunlight broke forth again and brought me much relief.

With the clearing weather I found myself to be on a long high point of sand, reaching far out into a lake, from which it

would be necessary to retreat and make a detour, but anything was better than lying shivering in the darkness and rain, so I resumed my tramp, or track survey, as a real pleasure, and hoped for better days, but they were not to come just yet. I took advantage of all the daylight the 22nd could afford me for travel and made a good day, but the next brought repetition of the storm, a gale from the north-east with driving rain and sleet—so severe that I was forced to seek shelter, which to some extent I found on the lee side of a rock. Here I spread my canvas, and wrapping my wet blanket about me, remained for two days, until the storm of wind, rain and snow had spent its fury. My biscuits were now all gone, and the only available stimulant I had at this camp was the remainder of my flask of brandy, of which I gladly availed myself.

My condition had become decidedly serious. I had not slept a night since I had left my canoe, and this wretched weather and lack of food was already telling seriously upon me. The barren ground is a most inhospitable place in bad weather, but having exposed myself to its inhospitality there was only one thing for me to do, and that was to get out again as best I could, and this I was quite resolved to do.

The morning of the 25th brought a slight improvement in the state of the weather, so that I was able to get on my feet again and stagger along under my load—made doubly heavy by its weight of water.

By noon the rain ceased entirely, when I was able to make a heather fire and cook some venison, which revived me much. The next morning I found a quarter of an inch of new ice on the ponds, but getting under way I soon came to a very large lake—the one I believe shown by Back on his Indian sketch, and recently named Campbell Lake.

Its shores are formed of high white sand ridges, and afforded good travel, which was most acceptable to my sore feet and worn-out moccasins. The country in the vicinity of Campbell Lake presented a less rugged and more pleasing appearance than it had done since leaving Thelon. Berries of several kinds had again made their appearance and deer trails were well defined and deep, although it should be noted that these latter were everywhere to be seen throughout my journey.

Fifteen miles were traveled during the day, chiefly along the shores of Campbell Lake, and the next day, my fifteenth out, a

similar distance was covered and my first sight of a growing tree obtained since leaving the Thelon valley. There was but a small grove of them, but they meant much to me, not only in administering to my immediate comfort, but as foreshadowing the end of my difficult journey.

Before noon of the following day I had reached my supply cache on the shore of Artillery Lake, and completed an uncomfortable tramp of 180 miles.

A rest of several days was now indulged in, since the weather continued very bad, but it gave me an opportunity to overhaul my outfit, repair moccasins, and pack specimens, etc., for shipment home. On September 4th and 5th, I was enabled to complete my unfinished survey of the north end of Artillery Lake, and having done so, I left a letter at the mouth of the Casba River for Fairchild, instructing him where to meet me, and turned about to proceed to Fort Reliance.

A head wind sprang up, however, and I was induced to go ashore until it might moderate, and meanwhile was overtaken by Fairchild, who had received my note within an hour of the time I had posted it up. We were now again a united party, and all in the best of health and spirits, and there was nothing left for us to do but to get home as quickly as possible. High winds on Artillery Lake caused us some delay, but by the evening of September 13th we were all once more encamped at Old Fort Reliance.

RETURNING HOME.

As arranged with Mr. Gaudette in the spring, we were met by him in his steamer "Argo" at the old fort on the 15th, and the next day were taken in tow, bound for Forts Resolution and Smith. Unfortunately on the 20th, at Stony Island, only twenty-five miles from Resolution, we encountered a gale which drove the "Argo" on to the rocks, smashing her wheel, keel and rudder.

Fortunately no further damage was done, and after effecting temporary repairs, we got her into Resolution on Sunday morning, September 23rd, three days behind time.

Four more days were then spent in repairing the "Argo" more substantially for her trip up the Slave River to Fort Smith,

so that it was late on the 27th before we were again under way.

At Resolution I learned with regret that many of our faithful dogs had died during the summer under the tender (?) care which they had received, but the surviving ones were placed in the canoes and taken with us.

On the evening of the 30th, when about half way to Fort Smith, we were again doomed to misfortune. This time it was our engine that broke down, and one day was lost in repairing it. Besides, her steaming capacity was seriously affected through the accident, so that it was the evening of October 4th when we reached Smith, and the 10th when with our three canoes we sailed up to Chippewyan. Through our unfortunate steamboat experiences we had lost just ten days on my reckoning, and were consequently too late by all accounts to make Athabasca Landing by open water.

I decided, therefore, to accept what seemed the inevitable and remain at Chippewyan, where we could obtain supplies and lodgings, until such time as we might be able to proceed with our dogs. This we did, and through the kindness of Mr. Drever, Mr. Fraser, Rev. Mr. Warrick and others, our stay was made very pleasant indeed.

By November 14th the lake ice had become set and sufficiently strong to admit of our passage, so with three teams of our own, and two others which I hired to assist us, we set upon the final stage of our journey, and without entering into details thereof, arrived at Edmonton on December 6th, nine months and twenty days from the date of our departure.

SUMMARY NOTES.

The more important material results derived from my exploration are briefly as follows:

1st. The obtaining of a correct topographical map of the routes traversed, in connection with which may be mentioned the discovery of the Thelon River—one of the finest in Canada—navigable for river steamers or other boats of light draught all the way from Hudson Bay to the forks of the Hanbury, a distance of 550 miles, excepting perhaps at two rapids on the river above Baker Lake, where some improvement to the channel might be made. Just what length of time this route may be

open for navigation I am unable to say precisely, but would judge that the river portion must be open at least five months, and the inlet and the larger lakes about a month less, i.e., during the months of July, August, September and October.

Thus the possibilities and extent of navigation from Hudson Bay toward the west, by way of Chesterfield Inlet, have been pretty well determined.

In the Mackenzie Basin, Charlton Harbor, at the head of Great Slave Lake, limits navigation from the west, and on its northern shore, by the mouth of the Lockhart River, is as pretty a town site as can be found in Canada. Between these two terminal points the only existing way of communication is by means of the excellent canoe route followed by my party.

For heavy commercial traffic a railway could be constructed without serious engineering difficulties, by avoiding the lakes along the Hanbury River route, there being no great elevations or other difficulties to overcome, unless it be the remoteness of the district and the scarcity of timber.

Should any kind of electric transmission become desirable, the two grand water powers of the Lockhart River and Dickson Canyon could be utilized to great advantage during the open season.

Besides the discovery of the Thelon as a commercial waterway the resources of its valley should be of great interest, particularly its timber supply and herds of musk oxen, both of which are of great value to Canada.

For the preservation of the musk oxen—which may be so easily slaughtered and are already rapidly diminishing in numbers—I would suggest that the territory between the Thelon and Back Rivers be set apart by the Government as a game preserve.

The chief food supply of the country lies in its great bands of caribou and its fish of various kinds, which are abundant in all the lakes and streams of the district.

The Thelon valley, though affording fine grazing lands for musk oxen and caribou, can scarcely be looked upon as a desirable agricultural district, although I judge from the growth and great variety of plants observed there, that some of our cereals and most of our hardy vegetables could be grown in the Thelon valley.

As to mineral products, from what mention has already been

made of the rocks, it may readily be judged that the Thelon valley has little to offer.

With the Eskimos, however, many articles, such as arrow heads, spear heads, skinning knives, etc., were observed, which have been beaten into form from native copper, which they explained to me had been picked up as pebbles from the ground somewhere far to the northward near the salt water.

DISCUSSION.

Mr. Tyrrell—There is one point that might be interesting to mention in connection with the trip—the whole valley of the Thelon River is a ferile oasis in the desert. For hundreds of miles both to the south and north there are expanses of so-called barren land, growing only moss and grass; but the valley of that river, for a distance of about 150 miles at all events, is well-timbered and contains a luxuriant vegetable growth.

Mr. Morris—What is the general character of the rivers? Are they of sufficient depth?

Mr. Tyrrell—Yes; the Thelon is a magnificent stream, navigable for large boats; steamboats can go up to the junction of the forks there, which is 550 miles up from the Hudson Bay.

Mr. Morris—The width would be considerable.

Mr. Tyrrell—The average width is about 400 yards.

Mr. Morris—How does it compare with the Rainy River?

Mr. Tyrrell—It is much swifter than the Rainy River.

Judging from the vegetation I saw, one would suppose almost anything would grow there. I never saw finer natural hay meadows than I saw along that river; the marsh grass was so long it almost hid the heads of the musk oxen feeding as we passed. We passed herds of musk oxen at every bend of the river; sweeping around with our canoes we would come on them, generally feeding in these high meadows.

Mr. Morris—What other animals are there beside the musk oxen?

Mr. Tyrrell—Great numbers of reindeer, besides wolves, wolverines and bears. One interesting animal we met with was a barren land grizzly bear, and Mr. Fairchild had the honor of

meeting and killing him. I only heard of one specimen being got there before, that was by one of Franklin's party, away back in 1820—Dr. Richardson. He speaks in his book of having met with barren land grizzly bears, and having killed one. In my travels previous to 1900 I have frequently enquired from the Hudson Bay people and from the natives themselves about these bears, asking them if they had ever seen any or ever known of any such bears out in the barren land; and I never could hear a word of such animals, so that it was a matter of great surprise to me when we came across a specimen and secured him, proving the story of Dr. Richardson of eighty years ago.

Mr. Morris—Was he as large as the Rocky Mountain grizzly?

Mr .Tyrrell—The one that Fairchild shot was smaller; it was quite a small bear, not more than five or six hundred pounds.

Mr. J. F. Whitson—Is the nature of the timber suitable for lumber? And what facility is there for getting it to the ocean?

Mr. Tyrrell—You could raft it right down to Hudson Bay; indeed, in 1893 some may remember that in writing my book describing our 1893 journey I spoke of finding large quantities of heavy driftwood on the Dubont River at the confluence of another river coming in from the west that I did not know the name of at that time. That was the confluence of the Thelon and Dubont. At that junction we found large quantities of well preserved driftwood with scarcely any bark pulled from it. From that fact I was aware than that there must be timber up the west branch and there could be few if any rapids on the river, which we found on this latter trip to be the case. That timber could very easily be taken down to any point below the two little rapids, or rather chutes. There is very heavy water on the lower portion of the river down near Hudson Bay, but there is a great depth of water, and it would only require some little improvement in the rapids to make them navigable to steamers, or I fancy they could be navigated now with a stern-wheeler.

Mr. Whitson—Is the spruce large?

Mr. Tyrrell—Up to fifteen or eighteen inches in diameter. The average would be smaller.

Mr. Whitson—Was it tall?

Mr. Tyrrell—Yes; well-developed trees.

Mr. Whitson—What would be the highest point attained?

Mr. Tyrrell—We were just about sixty-five degrees north.

Mr. Whitson—What kind of timber did you say was there?

Mr. Tyrrell—White spruce, a few sticks of tamarack—very few—nearly all white spruce.

Mr. Whitson—What was the highest latitude you got the timber at?

Mr. Tyrrell—We found trees from six to ten inches, plenty of spruce timber, in latitude about sixty-four.

Mr. Whitson—Was the timber belt of any great width along the river?

Mr. Tyrrell—It extended as far as we could see from the tops of the hills; but I do not imagine it extended many miles back; I think it was confined to the valley of the river, ten or twenty miles on either side I fancy would be the limit of it.

Mr. Whitson—From the general character of the country you would hardly conclude it to be a very valuable addition to the great Canadian Northwestern Empire?

Mr. Tyrrell—Yes, I would. Not as a farming country, but it is one of the greatest natural highways into the interior that one can imagine; you can bring steamers from the Atlantic up to within 160 miles of the head of steamboat navigation on the Mackenzie River water system.

Captain Gamble—Or Great Slave Lake?

Mr. Tyrrell—Yes; there you have about 4,000 miles of uninterrupted navigation on the Mackenzie River and its tributaries.

Mr. Morris—How far south would that system of navigation extend, tending to connection with any of the railways now projecting?

Mr. Tyrrell—A number of railways are projected. For the Hudson Bay Railway, the most northern terminal point is at Fort Chudlash, about 500 miles south of this river.

Mr. Morris—To the westward, what would be the approach to the railway projected?

Mr. Tyrrell—The railway will be extended 100 or more miles north of Edmonton, the present terminus, to within about 250 miles of navigation. Some of the finest farming land in the country is north of Edmonton; and the Peace River country is magnificent land also.

A Voice—Is it all timbered?

Mr. Tyrrell—A good deal of it. You find also some natural meadow land.

[*This Association is not responsible as a body for the opinions expressed in its Papers by Authors.*]

TERRESTRIAL MAGNETISM.

SYNOPSIS OF A PAPER BY MR. ARTHUR HARVEY.

After a description of the instruments now used for measuring (1) magnetic declination, or the difference between astronomical north and the direction of the compass needle; (2) horizontal force, with which a needle hung east and west strains towards the north, and (3) the vertical force, or dip, the author showed how inconstant magnetized bars were, changing their position not merely from year to year, but from month to month, from day to day, and from hour to hour. The annual westward movement of the so-called northern magnetic pole was shown to be anything but regular, varying, it would seem, with the temperature of the years. The monthly changes were shown to be influenced by the seasons, while the irregularities, which last for a day or two, and are called magnetic storms, correspond very closely with the activity on the sun, as evidenced by its spots. A series of diagrams to illustrate this point was shown, being a comparison of those by Prof. Wolfer, of Zurich, Switzerland, relating to the spotted areas on the sun, with the excesses above average of horizontal magnetic force upon the earth. Of these we reproduce that relating to 1902, by which it will be seen that, with the exception of April, when there was a magnetic storm without concurrent sun-spots, the other disturbed periods were times of solar disturbance, too. The latter are usually a little in advance of the former, never more than a couple of days, which was explained by the theory that the spots, which are the after-effect of solar disturbances, had not remained vertical over the seat of those eruptions, but had been swept forward by rapid currents in the solar atmosphere.

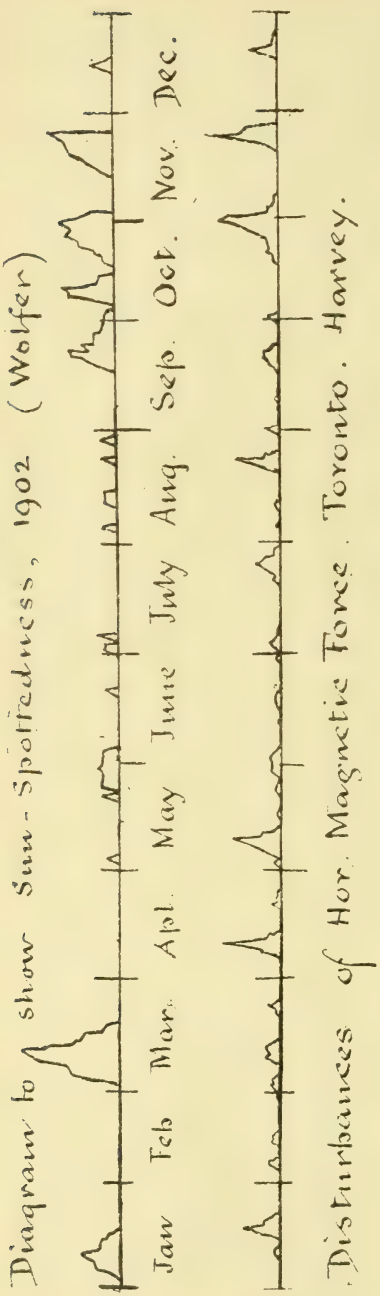


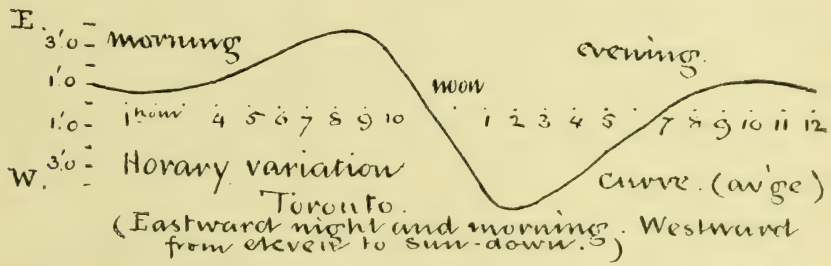
Diagram to show Sun-Spotfreduess, 1902 (Wolfer)
Jan Feb Mar. Apl. May June July Aug. Sep. Oct. Nov. Dec.
Disturbances of Hor. Magnetic Force. Toronto. Harvey.

Coming to horary variations, the author remarked that no sooner does the sun rise than the magnet begins to point more eastward, as if to greet it, and it swings back to its most westerly position at one or two hours after noon. The average morning easting at 8 o'clock in Toronto being 3'.8, and the westing at one hour after noon, 5'.0, the usual range between these hours is 8'.8. The difference becomes greater as higher magnetic latitudes are reached. There is also a second minor pulse as easting at nine or ten in the evening. The usual Toronto curve is shown on next page. The curves of each month of places in different latitudes were also exhibited.

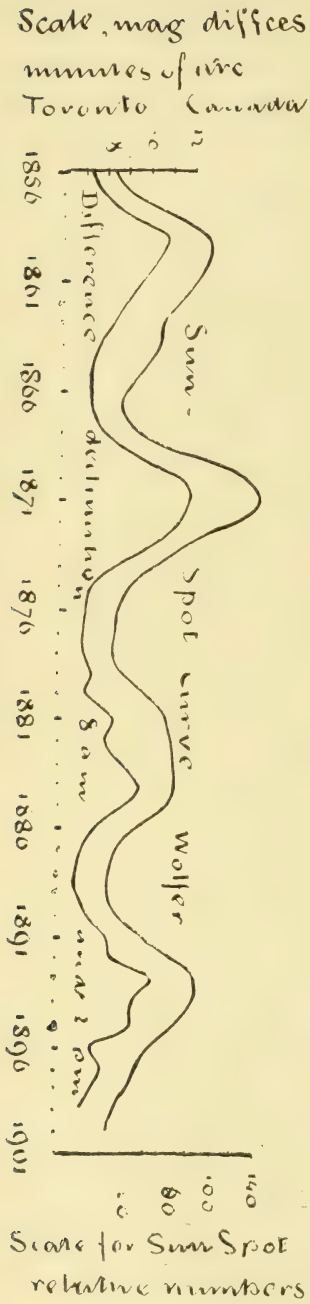
The range of this horary variation is greater during sun-spot maxima than at minima. Taking the average of the daily readings of the declinometer at 8 a.m. and 2 p.m. to be the mean monthly reading, the differences each month at these hours will increase towards maximum and decrease after it has passed. Averaging them for each year, we obtain a curve which agrees remarkably with the sun-spot curve given by

Prof. Wolfer, the recognized authority on the subject, and it is subjoined, as being the first prepared from Canadian data. We have at Toronto valuable magnetic records, by far the largest and most homogeneous series in America, which have been made available to the author by Mr. R. F. Stupart, the director of our observatory.

Referring to a paper by Mr. G. B. Kirkpatrick (trans. 1890), in which the average movement in declination was given (secular change), the author showed that it was irregular. In one year the difference was only 1′.73, and in others, 4′.47, 7′.67, and 10′.16. These changes did not seem to follow the sun-spot cycle, and indeed the cause was mathematically proveable to be internal. The author had provisionally determined that insolation was the principal cause of the variation of rate; that appeared evident from the registers at Toronto, but we might have to wait for a generation for records from other points, which were needed to substantiate this view.



The question of local attraction was next alluded to, and it was stated that the influence on the compass of a great mass of basaltic rocks could be traced at a distance of fifty miles. The enquiry was made whether magnetic storms were not a cause of danger to navigators steaming on the great circle between North America and British ports, which brought them for long distances within range of the iron-bound coast of Labrador, Newfoundland and Nova Scotia. Will a headland of primitive rock, which ordinarily has but a slight effect upon the compass at a distance of twenty miles, set it all wrong when a magnetic storm is in progress? Do submerged reefs at such times derange the needle? To judge by the magnets at our observatory, no storm should deflect them more than 2° or 3°, and then only for a short period, but our observatory, like all others, so far as Mr. Harvey knew, was built on alluvial soil. He had been aided by the



Messrs. H. and A. Allan in making enquiries of their captains, of whom some had reported extraordinary facts, such as a great compass error when off the coast of Cornwall, which lasted several hours before righting itself. Another had suggested that the polarity of the ship might be affected. The author quoted the "Newfoundland and Labrador Pilot" as follows: "On the coasts of Newfoundland and Labrador the variation of the compass changes so rapidly that the course of a ship requires to be constantly changed in order to steer in a straight line from one position to another." Also from Lord Kelvin's (Prof. Wm. Thomson's) "Popular Lectures," Vol. III., where the case of the "Meta" is mentioned, whose compasses were deflected two points for a short time, which was thought to be due to a sunken magnetic ridge, though she was in eleven fathoms of water. Was that disturbance intensified by a magnetic storm then prevailing? Are any of the wrecks clustered about Cape Race due to excessive derangement of the compasses by local attraction during such magnetic storms? He called attention to the magnetic survey of Holland, by which the position of the rocks on which the alluvial soil of that country was deposited had been determined, though no traces of such rocks were visible, and urged as an immediate necessity a complete and detailed magnetic survey of our coasts and the waters within ordinary soundings.

Mr. Harvey said the subject had not lost its importance on land, though our surveys were now made by the aid

of the transit. Sir Sandford Fleming, a Land Surveyor of great experience, had written to say that "the old surveyors intended the long road-allowances to be straight, and they were believed by the surveyor himself to be so, as day by day he ran the compass line through the forest, but they are really a series of slight curves. This fact was known to the old surveyors, but they had not learned to account for it." It clearly depended on the horary variation, sometimes intensified by magnetic disturbances. Mr. Harvey instanced the following declination changes in the working hours of two days, July 15 and 20, 1894, starting from the actual position of the needle at 7 o'clock, which he would call zero:

1894	*7h.*	*8h.*	*9h.*	*10h.*	*11h.*	noon	*13h.*	*14h.*	*15h.*	*16h.*	*17h.*	*18h.*	*19h.*
July 15	0	2′.8	5′.9	11′.8	15′.8	18′.7	26′.0	27′.5	27′.6	25′.2	19′.8	16′.5	17′.8
July 20	0	30′.0	19′.0	8′.2	6′.0	4′.9	6′.0	23′.0	5′.2	5′.8	17′.7	5′.0	1′.0

As 34′ of arc made a difference of a link in a chain, a surveyor running by compass might easily get half a chain astray on such days, even though he corrected himself for the usual horary variation. Mr. Spry, P.L.S., had said that this variation accounted for the curvatures in several of the principal streets in Toronto. A remarkable instance of the combined effects of local attraction and horary variation upon extensive surveys might be seen in the township of Belmont, which Mr. G. B. Kirkpatrick had resurveyed astronomically, exhibiting upon the new map the true form given by the old compass-survey. As there is a mass of magnetic ore in the middle of the township, the lines converged towards the center from both north and south, while the serpentine curving alluded to by Sir Sandford is noticeable, especially on the east boundary. Some of the farms are thus very much larger than others, and the "jogs" in the roads must be annoying. It is proper to say that the Director of Surveys differed from Sir Sandford as to the underlying cause of the irregularity; he laid it to the negligence of the surveyors. Mr. Spry had found the magnetic compass work well on the alluvial soil of the southern peninsula of Ontario, but on going north, it had to be dispensed with as a chief guide. This was due, said the lecturer, in some degree to the increasing latitude, but chiefly to the fact that on going north primitive rocks began to prevail on the surface. He had, however, heard of a case in which for a whole day the compass was unreliable at Eglinton, on alluvial

soil near Toronto, and it was not necessary to go north to find instances of variations due to subterranean causes; there was a wedge-shaped bit of country extending from Brockville to Ottawa and beyond, to the east of which the compass pointed very differently to what it did to the west. Captain Bayfield gave a case where on the shore of Lake Superior, in two places within a few miles, the compass registered 3° 50′ W. and 7° E. There was also a curious case south of us, for the isogonic lines made a respectful semicircle around Niagara Falls, and he (Mr. Harvey) sometimes wondered if the disturbance of the ether due to the great cataract could cause it, or if there were a great mass of iron ore under Port Colborne and Buffalo, or the roots of a mountain which had disappeared even before Silurian times.

Returning to the cosmical bearing of the subject, Mr. Harvey warned the members of the Association against believing that the whole force of a magnetic storm proceeded directly from the sun. He could find no flaw in Kelvin's equations, which worked out that in eight hours of the magnetic storm investigated (June 25, 1885) the electrical activity was 12×10^{35} ergs per second, while the sun-power radiated in light and heat was only 3×10^{33} ergs per second, which did seem conclusive against the storm being a direct conveyance of energy through the ether; it was perhaps some terrestrial conditions set in action by the excess of solar activity. He hoped that the surveyors would in future report the various magnetic phenomena they might notice at greater length than demanded by their instructions, and would also take careful notes of remarkable aurorae, which were closely connected with magnetic conditions. In such notes, the form of the streamers, the height and azimuth of the display and the color of the light might be important, especially during the next four years, which were to be spent by Amundsen near the north magnetic pole, in collecting facts as to the behavior of the needle in that vicinity.

DISCUSSION.

Mr. Sewell—I remember when I was out in India it was asserted in the papers by some astronomer that he could determine by the sun-spots when the famines were likely to recur. When the sun-spots were the greatest the famines would recur.

Those famines are the result of lack of water to enable the rich tropical earth to produce the necessary vegetation to support the people. The rains are not like those we have in this country, somewhat spasmodic efforts, but come down during certain periods of the year, called the northeast and southwest monsoons—that is, winds running in a certain direction carrying the rain—analogous to the trade winds. That astronomer maintained that when the sun-spots were the greatest (they were periodical and recurred at certain intervals), then there was scarcity of water and famines occurred.

I do not know whether Mr. Harvey could throw any light upon this, but it seemed to me that a portion of his paper pointed in this direction.

Mr. Harvey—The subject is not strictly magnetic, but it is hinted at in the curves of Mr. Bigelow. It seems that the storms which come down from the northwest do not always come down on the same track. If the storms come down on the same south-about track, they keep there during the year; if they are on a north-about track they will keep that up. If they go north of a certain line it will be a warm summer because the winds blow warm; if south of it, there will be a cool summer.

In the Indian Ocean the storms seem to begin somewhere off the South American coast. They are now correlating the observations in South Africa. In the course of two or three months the pressure gets transferred to South Africa, and then it comes into the regular Indian Ocean whirl and goes around. The pressure is now being looked into. When it gets into the regular swirl there is the regular monsoon. If it gets out of that the water blows on the Brackensburg and other mountains, where the fighting has been going on lately; then it deposits a great quantity of water in South Africa, and having done that there is a scarcity of rainfall in India, and the result is a famine.

It is not now supposed to be strictly synonymous with the sun-spots. Someone is working on it and thinks that it is connected with what are called solar prominences, and that when there are many solar prominences certain lines are seen which are not seen at other times, and that these are the causes of extreme pressure. I do not agree with that, because I do not see any lines. There seems to be another curve superimposed upon the solar curves about every three and a half years. That has to be studied on this continent as elsewhere. My conclusion

from examining the curves is that if you want to be accurate with the compass you will check your compass in some way at five, six or seven o'clock in the evening, when the compass is almost always at its original range, unless in the presence of a magnetic storm, which occurs about once a month. Any of these curves which I have given you will show that the greatest "easting" is about seven or eight o'clock a.m.—I have known it as far back as six o'clock in the morning, but usually it takes place about seven or eight and would average, I suppose, seven-thirty in the morning for the greatest "easting." Then the greatest "westing" would be probably between one and two. I have known it as early as noon and occasionally, in the case of a storm, as late as three o'clock. But when you come to about six or seven o'clock in the afternoon it is usually back at the normal. Some of these curves show it exactly. The compass is always right about six or seven o'clock in the evening.

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PUBLIC WORKS IN THE TOWNSHIP OF YORK.

BY PETER S. GIBSON.

Speaking first of our old statute labor system, and later of our commuted statute labor system as in cities, towns and villages. You all know about the old statute labor system, and you know what kind of a good time we used to have; it used to be called an outing, and possibly it was a kind of holiday. Generally after the seeding was done we would be called out and we would have a real good time.

We are told by Mr. Campbell, the Commissioner of good roads, that the statute labor in our Province amounts in round figures to about $4,000,000 a year. In ten years that would amount to about $40,000,000 worth of energy, as I suppose our friend Mr. Harvey might speak of it, and we might say, possibly, of energy wasted—some of it liquid energy and some never developed. Under the old system in a township we had a great number of pathmasters. In the Township of York they used to have about eight days' labor; sometimes the men would not get round on time and there would be very little work done. The statute labor was raised on the owners, on the tenants and by grants. There was statute labor straight, whether they were owners or tenants, and then the township supplemented it by grants for the work that the farmers could not do very well, and the farmers used most of their time on the slush scrapers, plows and carts.

In the last seven or eight years the Township of York decided to change that system; they found there was a large amount of money not expended, and the people came to ask for grants and the grants were said to be badly applied. The present system is that there is a rate of one dollar a day—in some of the townships it is about fifty or seventy-five cents a day—on the work that they should do, and that is added on to the tax bill. In the Township of York the commuted statute labor comes

to about $11,000 a year—that is a part of the $4,000,000 that Mr. Campbell speaks of being spent.

That $11,000 is not sufficient in the Township of York to do all the public works, and therefore the farmer where he has about 100 acres of land is allowed a certain number of days for his time. We had a partially commuted system first, and as Engineer of the township I recommended the township to do away with the whole system of statute labor. And first we had our township divided into four sections, numbered, one, two, three and four, and the trouble was to have the money expended put in the proper place. The system we have adopted is to have what we call township pay-sheets. The four divisions are divided into fourteen. There is a pay-sheet that we call our foreman's pay-sheet, and then we have the Township Engineer's pay-sheet. We have from fourteen to twenty-five foremen in the divisions. There are fourteen of these divisions where we have regular foremen who spend most of their time looking after these works in order to get at the matter in a proper way and make sure that each individual will get his share, because it was not as it is at the present time, difficult to get men, but there was a surplus of men, and some complaint was made that each one did not get his share. The foremen had to keep sheets and enter all their men. And also there was a list of the stone and gravel and that kind of thing to be kept up.

Of course these foremen were not artists or penmen, and very often a first-class workman had to depend upon his wife to write out these pay-sheets, and as it was possible that some of the foremen might make a pull and not come up to the mark, there is on the back of the foremen's pay-sheets a declaration to be signed and made before a magistrate. These foremen's pay-sheets were very difficult to decipher sometimes, and therefore we adopted the principle of having an Engineer's pay-sheet, in which the whole matter was boiled down and a synopsis shown. It all had to be passed by the Finance Committee, and certified by the Engineer and also by the foreman. The pay-sheet prepared by the Engineer was that upon which the Treasurer prepared his cheques. In that way we spent about $4,000 a month.

Whether a man was a laborer or had a horse and wagon, and whether the material was lumber, stone or whatever it was, it was entered in the proper column. Payments for laboring men or for horses would all appear on the cheques, therefore all the

auditors had to do was to follow it down and check the items with the cheques.

It is a pretty hard thing to work for a lot of old farmers and please them. Mr. Campbell says that when he got into one place he told them that they did not know much about road making, and they got pretty mad at him and he had to tell them that he was speaking of some other place, and then he was able to give them the information that they needed for the improvement of their roads.

We are building now by contract a steel bridge on four columns, which will cost about $1,624; but the embankment is built by day labor, the foreman employing the men and teams and making the returns on his pay-sheet.

A while ago they wanted a bridge with approaches built and called for tenders. A number of tenders were received and the Council passed a resolution to accept a certain tender. I provided that the payment by cubic yard should be made on the earth after it was put into the embankment.

There is a great difficulty in getting men to work by the day. In order to get at a system in our road-making we found it necessary that the roads should be thoroughly drained. The great fault in all our roads in York was very poor drainage. The community in general drains on the public road and expects the township to take care of the water. If there is a running spring with a natural run it has to have its own way; but when it comes to surface water on an ordinary drainage area, with no natural run, you have trouble with the water. Chief Justice Armour once said in a case before him that a certain man could build a stone wall across his front and refuse to take surface water from his neighbor's property. When drainage is artificial we cannot discharge on private property unless we proceed under the Drainage Act or the Ditches and Watercourses Act. I once suggested that we should have an Act passed by which the Council might proceed at once without waiting to act under the Drainage Act or the Ditches and Watercourses Act, but it did not succeed.

The point has been raised in Welland whether a township can initiate the work of draining on to private property.

If we have the road drained all right, then the next thing is to turnpike it and get the surface sufficiently high so that the metal will not turn into mud.

We have two classes of graders, large and small. The large one works well on a large job; but in the township of York the foremen prefer the small grader. It is generally impossible to get two or three teams when they want to work the grader, because you cannot get farmers to take their teams from their own work to do work on the road.

If we wish to put gravel on a roadway that has more or less loamy soil on it we find it better to let the road be traveled for one year, until the loamy matter is almost worn out of the roadway and it becomes hard, tenacious clay; then apply the gravel or stone. In some places we build what we call a cedar-macadam-gravel road, and in the contract for such a road we provide that culled cedar posts may be used, and that in the case of partially decayed wood the size of the post must be increased. These posts are found in the yards where they cut up cedar for blocks.

The next difficulty is to get a large amount of stone. One contractor brought in immense quantities on the cars, as he was doing miles of work. I provided that the stone should be broken on the cedar posts so as to consolidate it so that the posts would not slip. The farmers want $8 or $9 a toise for stone, and it cos s $6 a toise to break it; $15 or $16 per toise is pretty costly stone for roads for farmers. The trouble is to manufacture a road in country places to suit farmers' traffic.

Near Willowdale, where I live, we found stone was difficult to get, and we resorted to the rivers, where we can get screened gravel for about fifteen cents a load. We can put it down for about $7 to $9 a toise, and gravel does not wear away like broken stone. This stone that we take from the river-bed of the Don, especially in the west branch, is a very hard stone, I think broken-up boulders, and the difficulty is to get it worked in; but when it is worked in properly—we do not have rollers for the purpose—it makes a good road, which becomes smooth and even much more quickly than a broken stone road.

On account of the scarcity of stone last year we proposed getting broken stone from the Township of King. We have not sufficient stone in the Township of York to employ a machine.

As to the rolling, there is another difficulty—the rollers that we see in the exhibition grounds weigh seven, eight or ten tons. If we took one of those rollers out into the township every culvert and bridge would be broken down. Besides, if the roads

should be a little mucky the roller could not get along, and as they are expensive the Council cannot indulge in such luxuries. To supply this want we load a good, heavy, strong, wide-tired wagon with stones, and it does the work. I asked the Hamilton Wagon Company and the Wilkinson Plow Company if they could not make us a roller which we could load with stone to do that work and then unload it, but I have not heard anything further from them.

In new counties the county should run the grants, but in a township like the Township of York it is better for the township to have the money. There are certain leading roads already established and turnpiked properly and macadamized, which require to be kept up by repairs. Under the old system there were too many influences for work to be properly done. Now, from year to year, we make reports to our Council and prepare statements. In 1901 we prepared a statement showing the fourteen different sections with the labor, stone, material, gravel and sewer pipe. We get sewer pipes very cheap near the city here and they are easily handled. I believe concrete pipes are cheaper, but they are very heavy to handle, and they break so easily. It is also a question whether in time the frost will not destroy them; vitrified sewer pipes do not absorb water, and the frost would not affect them in the same way. We use the best of pipes up to two feet in diameter, and in cases where one pipe will not take all the flow, we put one in the bottom and then raise the other up a foot or two feet to take the flush of water. There is difficulty with sewer pipes if a core of ice forms in them.

We have a form of tender which we furnish and also a form of agreement. In very important cases we employ our solicitor to get up a form of agreement in print, to be used in such a case as a steel bridge. In bridge work we are now using steel almost entirely instead of wood.

DISCUSSION.

Mr. Wilkie—What strength is specified for your bridges?

Mr. Gibson—In steel bridges about ninety tons, especially at the foot of a hill, and then the roadway must be sufficient to carry the heaviest traction engines, with a width of about six or seven feet.

Mr. Wilkie—What weight is the heaviest traction engine?

Mr. Gibson—About seven tons.

Mr. Wilkie—What do you do about piers?

Mr. Gibson—The last bridge we built had four columns and we put in concrete foundations to stand the columns on, and filled them with concrete. It is rather difficult to get them filled in the winter time.

At the Humber there is a bridge with concrete abutments, which of course had to be put upon piled foundations, as it was so deep.

The great problem is, how to do public works without money. Any ordinary Engineer can do it if he is able to spend plenty of money.

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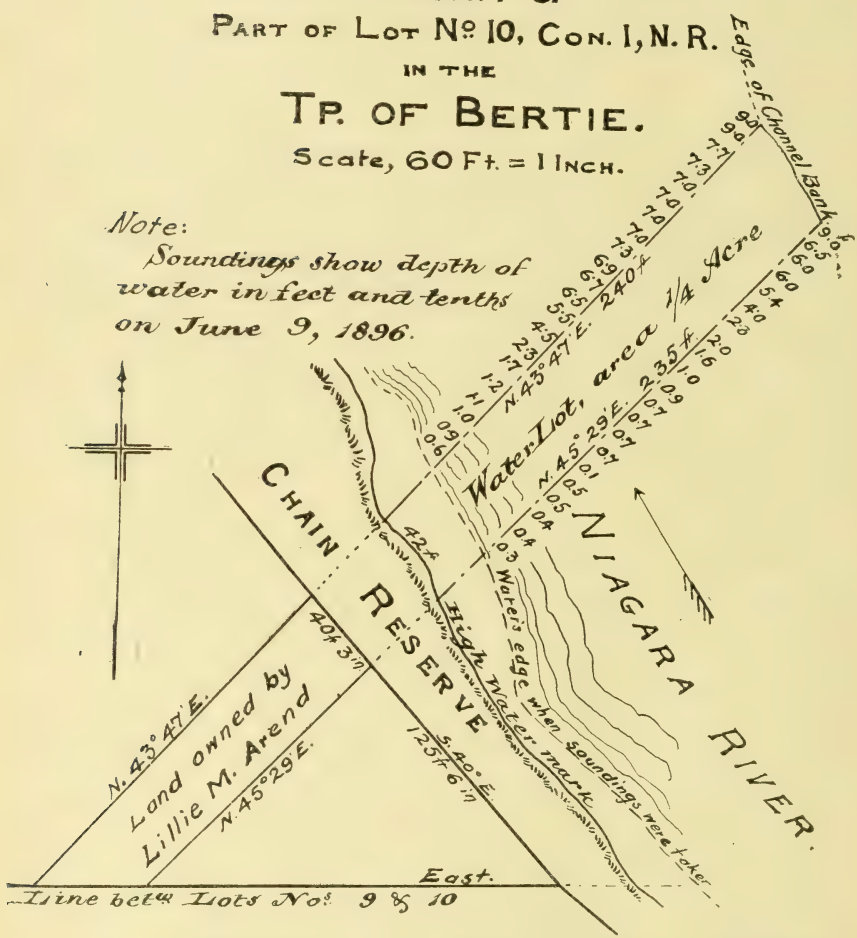
WATER LOT SURVEYS AND PLANS.

BY GEO. ROSS, O.L.S., WELLAND.

For some years the ownership of the beds of lakes and navigable rivers in the Province of Ontario was in dispute between the Government of this Province and that of the Dominion of Canada, but the matter was finally settled by the decision of the Judicial Committee of the Privy Council in favor of Ontario, the Dominion being confirmed in the ownership of the harbors. During the period of litigation, parties desiring to obtain water lots in this Province would in some instances apply for them to the Ontario, and in other cases to the Dominion Government, as patents were issued by both, but since the decision of the Privy Council applications are made only to the Commissioner of Crown Lands of Ontario.

As a rule, water lots are granted only to the owners of the land fronting or abutting on the portion of the lake or river required, and the application should be accompanied by a duly certified abstract of title, together with a plan and description, certified by an Ontario Land Surveyor. The plan must show the soundings or depths of the water, at distances of every ten feet out from the shore. The soundings may be taken along the limits of the lot extending into the water, or along lines at right angles, or approximately at right angles, to the shore line, at distances of say from two to six or eight hundred feet apart, or close enough together to give a good idea of the contour of the bed of the lake or river. The distance to which the water lot should extend out into the body of water will vary according to the purposes for which it is required. Some parties apply for water lots merely for the purpose of protecting the beach, to guard against trespassers, or to prevent sand, stone or gravel from being carted away from the shore. In such cases, the applicant usually desires to have the lot extend only a short distance from the shore line, and is generally satisfied with a depth of two or three feet of water. Others again may wish to build a dock, and may require a depth of from twelve to twenty feet,

PLAN OF WATER LOT
IN FRONT OF
PART OF LOT Nº 10, CON. 1, N. R.
IN THE
TP. OF BERTIE.
Scale, 60 Ft. = 1 Inch.


Note:
Soundings show depth of water in feet and tenths on June 9, 1896.
Edge of Channel Bank
Water Lot, area 1/4 Acre
N. 43° 47' E.
240 ft.
N. 45° 29' E.
235 ft.
CHAIN RESERVE
424
High Water's edge when soundings were taken
NIAGARA RIVER.
N. 43° 47' E.
Land owned by Lillie M. Arend
N. 45° 29' E.
404 3 in.
S. 40° E.
125 ft 6 in
East.
Line betw Lots Nos 9 & 10

I hereby certify that this plan is correct and is prepared from actual survey made by me.

Ontario Land Surveyor

Dated _____

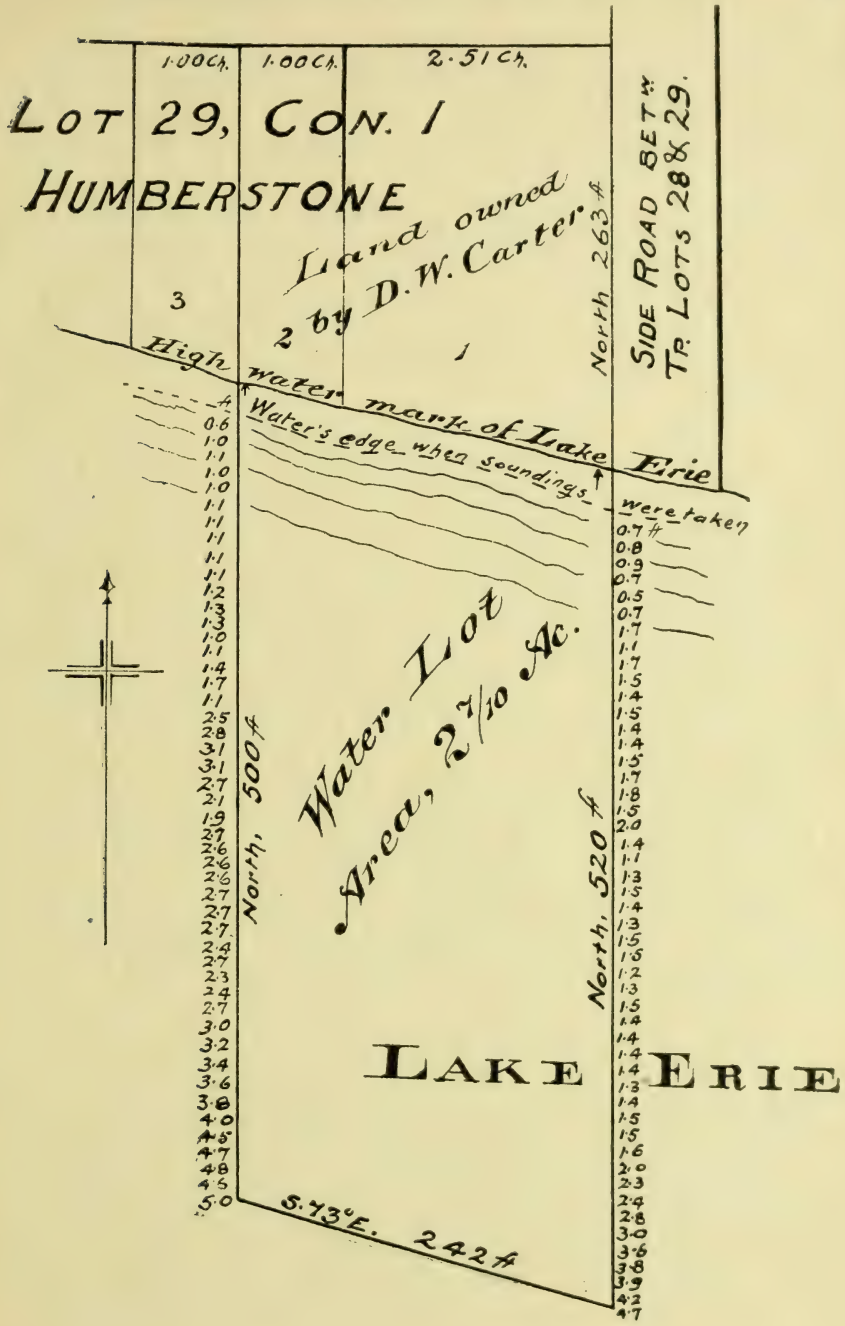
or may desire the lot to extend out to the edge of the channel bank, where the water suddenly becomes deeper; thus in some cases the lots are required to extend only a few feet out from the shore line, and in other cases it may be necesary to extend a quarter of a mile or more out into the body of water. Some eight or ten years ago, the Crown Lands Department did not require the soundings to be shown on the plan. Then it was a comparatively simple matter to make a water lot survey. Merely make a traverse of the lake or river front, get the intersections of the lot limits and the remainder of the work could be done in the office. In some cases the applicant requires soundings taken for his own use and may desire the depths to be shown on lines running out at distances of one hundred and fifty feet or so apart.

A traverse line should be run along the front and the points located on it from which the lines of soundings would be run out. The range of these lines along which the soundings are to be taken can be shown by a couple of pickets set up on land as required and the line on the water can be given accurately with the transit when necessary. The distances out from the shore can be obtained by paying out a light chain or wire cable wound on a reel, and having the measurements marked off with brass tags, as on an ordinary chain. A light hemp rope, marked off every ten feet with a small piece of red flannel, and having the fifties and hundreds marked with white flannel, will if properly tested be found fairly satisfactory. It is not necessary to have the rope on a reel, as it can be extended along the shore or run out from a coil. In some cases it may be necessary to use floats on the cable or rope in measuring the distances out from the shore, and if a rope is used and the line of soundings exceeds a couple of hundred feet, it is advisable to verify some of the measurements by triangulation to a float anchored, or a stake driven at the point to be tested. In cases where it is necessary to adopt triangulation generally, two instruments should be used simultaneously. The depths can be ascertained by using a rod marked off like a level rod and held by an assistant in a rowboat. One end of the measuring line can be secured to the boat, and the other end held by an assistant on the shore, who pays out the line, ten feet at a time. The boat should be rowed out as straight as possible, but it is sometimes very difficult to keep it on the proper range, owing to the wind or current. Sometimes soundings may be taken very accurately on ice, but

often the ice along the shore is piled up in hummocks or windrows, rendering the work rather slow and difficult. About a month ago I was taking soundings on the ice along the edge of the Niagara River, and after taking the depths on a couple of lines extending out about four hundred and fifty feet from the shore, I ceased work for the day. During the night a storm had raised the water in the river and early next day the ice was loosened and broken up, and by noon had entirely floated away, leaving me to complete the work by using a boat as already described. For the sake of comparison I went over one of the lines sounded on the ice, and after allowing for the difference in elevation of the water at the different dates, found the two sets of soundings to agree very closely. Taking soundings is often rendered very difficult by rough or stormy weather, and it is frequently found necessary, in exposed positions, to postpone the work and watch for a calm day.

Although it is not called for by the Crown Lands Department, it is advisable where possible to obtain the elevation of the water in the lake or river, by connecting it by a line of levels to some permanent bench mark, especially if the elevation of the latter above sea level datum is known. A book entitled "Altitudes in the Dominion of Canada," issued by the Department of the Interior, in 1901, gives a large amount of information with regard to bench marks and the elevation of water in various lakes and rivers. With the above information the high-water mark might be ascertained in a fairly satisfactory manner.

The plans should show the location of the land of the applicant, with special reference to the original township lot lines, and have the water lot clearly defined by courses and distances, or with such reference to the shore line and channel bank as may be necessary to fix its boundaries. The limits of the water lot extending out into the lake or river should preferably be laid down parallel to the township lot lines but their direction would naturally be varied somewhat according to the trend of the shore line, or the manner in which the township lots were subdivided, and care should be taken at all times not to encroach upon what might be justly claimed by the owners of adjoining lots. The area of the water lot must also be given, as the price charged is usually so much per acre, say $5, $10 or other sum, varying according to the locality. Accompanying this paper are a couple of plans, which will give a general idea of what is required.


1.00 Ch.
1.00 Ch.
2.51 Ch.
LOT 29, CON. 1
HUMBERSTONE
Land owned by D. W. Carter.
3
2
1
North 263 ft
SIDE ROAD BET. TP. LOTS 28 & 29.
High water mark of Lake Erie
Water's edge when soundings were taken
Water Lot
Area, 2 7/10 Ac.
North, 500 ft
North, 520 ft
LAKE ERIE
S. 73° E. 242 ft

The description of the water lot in front of part of lot number 29, in the first concession of the township of Humberstone, may be given as follows:

" That parcel or tract of land covered with water, lying in front of part of lot number 29, in the first concession of the township of Humberstone, in the county of Welland and Province of Ontario, and which said parcel or tract of land and land covered with water may be otherwise known as follows:

" That is to say, being composed of water lot in Lake Erie, in front of subdivision lots numbers 1 and 2, according to a plan of part of said lot filed in the Registry Office for said county as number 14 for said township:

" Commencing at the south-easterly angle of said township lot number 29, being a point in the high-water mark of Lake Erie; thence south along the production of east limit of said township lot, five hundred and twenty feet; thence north seventy-three degrees west, two hundred and forty-two feet, more or less, to a point where this course would be intersected by the west limit of said subdivision lot number 2 produced south; thence north, along said produced limit of said lot number 2, five hundred feet, to the high-water mark of Lake Erie; thence easterly along said high-water mark, to the place of beginning, and containing an area of two acres and seven-tenths of an acre, be the same more or less.

" The said parcel being shown colored pink on a plan of survey by Ontario Land Surveyor, George Ross, dated May 3rd, 1899, and of record in the Department of Crown Lands."

Under " The Beach, Shore and River Bed Protection Act," provision is made for the prosecution of trespassers on beaches and shores in certain cases, and I shall quote a couple of sections showing its scope.

" 3.—(1) No person shall take or carry away in any vessel, boat, scow, raft or other craft, or otherwise transport by water, any sand, gravel or stones from the beach, shore or waters of Lakes Erie, Ontario or Huron, so far as they are within the legislative jurisdiction of this Province, or from any bar or flat within such jurisdiction adjoining any channel or entrance to such lakes unless such sand, gravel or stone is taken from a locality distant three rods or more beyond low water mark; or, in case the same is taken within that distance, unless such person has the written consent in that behalf of the owner of the beach,

shore, bar or flat; or, in case the said beach, shore, bar or flat belongs to the Province, unless such person has the consent of either the Lieutenant-Governor-in-Council or the owner of the land to which such beach, shore, bar or flat so belonging to the Province is adjacent.

"(2) The consent of the Lieutenant-Governor-in-Council in respect of land belonging to the Province, shall be sufficient without the consent of the owner of the adjacent beach, shore, bar or flat; and such consent," etc. 52 V. c. 8, s. 3.

"4. No person, without the consent aforesaid, shall land or go upon any beach, bar, flat or shore, with intent to remove, or take or carry away, or to assist in removing or taking or carrying away any gravel, sand or stones therefrom." 52 V. c. 8, s. 4.

The application of "The Beach, Shore and River Bed Protection Act" appears to be comparatively restricted, and I have known parties who had taken legal advice with the intention of entering actions for trespass under it, end up by applying for water lots, and after obtaining the patent they had no further trouble in protecting their beaches or shores.

The only drawback to water lots is that they are subject to taxation the same as other real estate.

At the beginning of this paper I referred to the dispute as to the ownership of the beds of lakes and rivers, and will close by giving some extracts from the report on the case, which was decided by the Privy Council on May 26, 1898.

Three appeals by the Dominion of Canada, by the Province of Ontario and the Provinces of Quebec and Nova Scotia from a judgment of the Supreme Court (Oct. 13, 1896), delivered upon seventeen questions referred to it by the Governor-General of Canada, pursuant to Revised Statutes of Canada, c. 35, as amended by Canadian statutes 54 & 55 Vict. c. 25.

The questions referred were as follows:

(1) Did the beds of all lakes, rivers, public harbors and other waters, or any and which of them, situate within the territorial limits of the several Provinces, and not granted before confederation, become under the British North America Act the property of the Dominion or the property of the Province in which the same respectively are situate, and is there in that respect any and what distinction between the various classes of waters, whether salt waters or fresh waters, tidal or non-tidal, navigable or non-navigable, or between the so-called Great Lakes, such as

Lakes Superior, Huron, Erie, etc., and the other lakes, or the so-called great rivers, such as the St. Lawrence River, the Richelieu, the Ottawa, etc., and other rivers, or between waters directly and immediately connected with the sea-coast and waters separating (and so far as they do separate) two or more Provinces of the Dominion from one another, or between other waters and waters separating (and so far as they do separate) the Dominion from the territory of a foreign nation?

(2) Is the Act of the Dominion Parliament, Revised Statutes of Canada, c. 92, intituled ' An Act Respecting Certain Works Constructed in and over Navigable Waters," an Act which the Dominion Parliament had jurisdiction to pass either in whole or part?

(3) If not, in case the bed and banks of a lake or navigable river belonging to a Province, and the Province makes a grant of land extending into the lake or river for the purpose of there being built thereon a wharf, warehouse, or the like, has the grantee a right to build thereon accordingly, subject to the work not interfering with the navigation of the lake or river?

. . . . . .

(16) Has the Dominion Parliament power to declare what shall be deemed an interference with navigation and require its sanction to any work, or erection in or filling up of navigable waters?

. . . . . .

Before approaching the particular questions submitted, their Lordships think it well to advert to certain general considerations which must be steadily kept in view, and which appear to have been lost sight of in some of the arguments presented to their Lordships.

It is unnecessary to determine to what extent the rivers and lakes of Canada are vested in the Crown, or what public rights exist in respect of them. Whether a lake or river be vested in the Crown as represented by the Dominion or as represented by the Province in which it is situate, it is equally Crown property, and the rights of the public in respect to it, except so far as they may be modified by legislation, are precisely the same. . . . It must also be borne in mind that there is a broad distinction between proprietary rights and legislative jurisdiction. . . . There is no presumption that because legislative jurisdiction was vested in the Dominion Parliament proprietary rights were trans-

ferred to it. The Dominion of Canada was called into existence by the British North America Act, 1867. Whatever proprietary rights were at the time of passing that Act possessed by the Provinces remain vested in them except such as are by any of its express enactments transferred to the Dominion of Canada.

With these preliminary observations their Lordships proceed to consider the questions submitted to them. The first of these is whether the beds of all lakes, rivers, public harbors, and other waters, . . . became under the British North America Act the property of the Dominion.

. . . By the 108th section of that Act it is provided that the public works and property of each Province enumerated in the schedule shall be the property of Canada. That schedule is headed "Provincial Public Works and Property to be the Property of Canada," and contains an enumeration of various subjects, numbered 1 to 10. The 5th of these is "rivers and lake improvements." The word "rivers" obviously applies to nothing which was not vested in the Province. It is contended on behalf of the Dominion that under the words quoted the whole of the rivers so vested were transferred from the Province to the Dominion. It is contended on the other hand, that nothing more was transferred than the improvements on the provincial rivers, that is to say, only public works which had been effected, and not the entire beds of rivers. . . . Upon the whole their Lordships, after careful consideration, have arrived at the conclusion that the court below was right, and that the improvements only were transferred to the Dominion. . . .

With regard to public harbors their Lordships entertain no doubt whatever that which is properly comprised in this term became vested in the Dominion of Canada. . . .

Their Lordships think that the Legislature of Ontario had jurisdiction to enact the 47th section of the Revised Statutes of Ontario, c. 24, except in so far as it relates to land in the harbors and canals, if any of the latter be included in the words "other navigable waters of Ontario." . . .

Their Lordships entertain no doubt that the Dominion Parliament had jurisdiction to pass the Act intituled, "An Act Respecting Certain Works Constructed in or over Navigable Waters." It is in their opinion clearly legislation relating to "navigation."

DISCUSSION.

Mr. Kirkpatrick—There is one very good suggestion, the description of how to lay out the water lot and take soundings in accordance with the instructions which were given by the late Commissioner of Crown Lands, Mr. Hardy. In this portion, he says although not called for by the Crown Lands Department it is advisable where possible to obtain the elevation of the water in the lake or the river and connect it by a line of levels to some convenient bench mark, especially if the elevation of the lake taken before these levels is known. That is a very important thing, because, as you all know, the elevation of the lakes is very different at times; and in a case we have now before the Department a company is applying for power to hold up the waters of the lake at a height to be decided, by raising it to 615 feet above mean sea level at Quebec. Does that convey any idea to a practical Surveyor as to what height that dam should be built? In my innocence I do not see that it does, because, as pointed out, 615 feet above the mean sea level certainly fixes a thing that a Surveyor when he is called upon to give levels for such a dam doesn't know; and if the Department were to allow flooding to take place at a certain horizontal it would not tell him how much of the lands adjoining the lakes and rivers were going to be flooded. I suggested that there should be a permanent bench mark determining the height of the lake at the time the survey was made; then another bench mark put in, showing where the dam was to be built, and the levels taken between these two bench marks, and then the side of the dam was to be so many feet above the permanent bench mark at the level of the lake, which was one of the Great Lakes, on a certain day, as determined on that particular day. Then by taking the levels of the lake which was proposed to be dammed back, the Surveyor could easily discover what portion of land would be flooded; and I think that could probably be carried out, otherwise you could not tell without special survey what land was going to be flooded.

I think this is a very good paper.

Major Sankey—Mr. Chairman, I am very glad that a paper of this kind has come up and will be published in our next report. There are one or two points that have occurred to me that it would be very well to get some final and definite instructions on. I was very glad to hear the Director of Surveys make the sug-

gestions he has of having a permanent bench mark, showing the level of the water. I understand in Lake Ontario that the question has arisen whether the land covered by water is held under the original or under the water-lot grant. There is a case where the question of a water lot was taken up before the courts, as to whether if the grant of the water lot was cancelled how far the original owner would own; it was a case of a road allowance where the municipality claimed that a certain portion of the land belonged to the road allowance; the portion which the municipality claimed as a road allowance was covered by water and there was no riparian owner south of the road. It was held that if it could be shown that the original grant had gone south, that the land had been above the water, then the original owner did own it, although covered by water. Perhaps as far as navigation was concerned, his ownership would be restricted to a certain extent. That was the ultimate decision of the court that tried that case. Witnesses were brought and it was perfectly clear that the waters of Lake Ontario had encroached on the lots.

The question of how you are to get grants is also somewhat in dispute; if it is inside the harbor I suppose you must go to the Dominion Government, because the harbors of the country are under their control. There was a case not long ago of a Dominion grant of a water lot which was in a harbor, whereas the lands covered by water are now no longer required for public purposes. The Dominion had the right to grant it; but the parties interested went to the Ontario Government and obtained a similar grant; so that the owner of the water lot has two patents, one from the Dominion and one from the Ontario Government. These are two important points for consideration; I am glad this paper brings them up.

Another thing is whether a company having special rights of expropriating land has a right to acquire water lots, can it set up the claim that it is a riparian owner? I know the Ontario Government always considered that the riparian rights go with the water lot.

Mr. Shaw—In the case you spoke of, where the water encroached on the land, was it from a rise in Lake Ontario, or from the land washing away?

Mr. Sankey—Possibly one and possibly both. I think the first great breach or encroachment the water made was due to

a very heavy storm in the spring of the year, but undoubtedly the roots of trees were unearthed and the sand and gravel and clay were washed out. In fact, the road allowance in question was washed away. The evidence was that the road used to be traveled a chain and a half further south than it is to-day, and the road is on the margin of the lake. Of course the rise and fall of the lake is another point.

I suppose in Lake Ontario you can get from a chain to a chain and a half difference in the location of the water's edge between the water of one year and the water of another year. I know some years ago, in connection with arbitrations along the banks of the Don, we took twenty-eight inches above zero as the proper figure to estimate; that was figured up to about 1887. If we were to take it from 1887 to 1903, we would not be a great many inches above zero because the water for a great many years has been inches and inches below what it was up to that year.

EXAMINATION PAPERS, FEBRUARY, 1903.

Preliminary.

LINEAR DRAWING.

Maximum 50; Minimum 25.

Note.—Show what is given in light lines. Show construction in dotted lines. Show the result in heavy lines, using only a compass and ruler.

1. Draw a perpendicular to a straight line from one end thereof.

2. Trisect the above angle. (Draw a new figure.)

3. Upon a line about 1½ in. long construct a regular hexagon.

4. Draw a straight line about 3 in. long and describe a quadrant of a circle with radius about 1½ in., touching it at one end.

5. Construct a scale of two miles to an inch to read tenths of a mile; give the representative fractions.

GEOGRAPHY.

Maximum 50; Minimum 25.

1. Describe generally the outlines of North America and the principal geographical and physical features. In answering this mention the chief gulfs, bays, straits, mountains and rivers.

2. Describe the chief river basins and give the principal sea or lake port situated on them.

3. Describe particularly the boundaries of Ontario and the general physical features.

4. Describe the canals of Ontario, give the waters they connect and their general size, length, etc.

5. Where are the following places, are they cities or towns, what railways pass through them and what water facilities have they got? Amherstburg, Cobourg, Brockville, Perth, Trenton, Rat Portage, North Bay, Harriston, Carleton Place, Prescott, Mattawa, Kincardine.

6. Name the zones and describe their climate for four seasons; give your reasons for the variations.

CANADIAN HISTORY.

Maximum 50; Minimum 25.

1. With what discoveries are the names of Marquette, Joliet and La Salle identified? Mention the circumstances under which these discoveries were made.

2. What were the causes of the rebellion of 1837-8 in Upper and Lower Canada?

3. How many contingents of soldiers left Canada to fight in South Africa during the Boer War, and who were their commanding officers?

4. What important subjects were discussed at the Colonial Conference held in London last year, and in what way did they affect Canada?

5. Who are the present members of the Canadian Cabinet, with portfolio, and what office does each hold?

MENSURATION.

1. The length of an irregular figure being 84 and the breadths at 6 equidistant places, 17.4, 20.6, 14.2, 16.5, 20.1 and 24.4, what is the area?

2. Find the area of a triangle, two sides being 80 and 90 feet, and contained angle is 28° 57′ 18″.

3. What is the area of a quadrilateral whose diagonals are 50 and 40 feet and included angle 60°?

4. Given the height and chord of an arc, 4 and 30 respectively, to find radius of circle.

5. The height of a segment is 18′ and the diameter of the circle is 50′, what is the area of the segment?

6. What quantity of land is contained in a triangle, the sides of which are 20, 30 and 40 chains? Give answer in acres, roods and perches.

EUCLID.

Maximum 100; Minimum 60.

1. If any side of a triangle be produced the exterior angle is equal to the two interior and opposite angles.

2. The complements of the parallelograms which are about the diagonal of any parallelogram are equal to one another.

3. In any right-angled triangle the square described upon the side subtending the right angle is equal to the squares described on the sides which contain the right angle.

3a. If a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts is equal to the rectangle contained by the two parts, together with the square of the aforesaid part.

4. If a straight line drawn through the center of a circle bisect a straight line in it which does not pass through the center, it shall cut it at right angles.

5. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles.

6. In any circle the angle in a semicircle is a right angle, and the angle in a segment greater than a semicircle is less than a right angle.

7. To describe an equilateral and equiangular pentagon in a given circle.

LOGARITHMS AND ALGEBRA.

Maximum 100; Minimum 60.

A.

1. Multiply by logarithms .007865 and 1.89523 and extract the fifth root of the product.

2. Find by logarithms the third power and the cube root of 3.51 and 121.

3. Find the numbers corresponding to the following logarithms, 2.8670076, 3.8960023, and 1.9380041.

B.

4. Factor the following: (*a*) $x^2y^2z^2 - 13xyz + 22$.
(*b*) $n^2 + 17n - 390$.
and (*c*) $x^2y^2 - 162xy + 6561$.

5. Simplify

(a) $$\frac{\frac{1}{a-x} - \frac{1}{a-y} + \frac{x}{(a-x)^2} - \frac{y}{(a-y)^2}}{\frac{1}{(a-y)(a-x)^2} - \frac{1}{(a-y)^2(a-x)}}$$

(b) $$\frac{a + \frac{b}{1+\frac{a}{b}}}{a - \frac{b}{1-\frac{a}{b}}} (a^6 - b^6).$$

6. Divide by Horner's method $x^6 - 1$ by $x - 1$.

7. Solve $5x + 7y - 2z = 13$.
$8x + 3y - z = 17$.
$x + 4y - 10z = 23$.

8. A person rows a distance of 20 miles and back in 10 hours; he finds he can row 2 miles against the stream in the same time that he rows 3 miles with it. Find the rate of the stream, and the time of his going and returning.

ENGLISH GRAMMAR.

Maximum 50; Minimum 25.

1. Name and distinguish the two parts that compose a simple sentence.

2. Enumerate and classify the parts of speech.

3. What is "inflection"? How is a verb inflected?

4. How is sex indicated by nouns? What is the figure known as "personification"?

5. How are adjectives divided? Give examples of each class. What are the superlatives of dry, distant, much, ill, near?

6. Write out the following sentence and correct where necessary: It is agreable to witnes the unparalelled saggacity of a harrassed peddler or coblar, sitting on a pibald poney pealing and pairing a potatoe.

7. Mention some events in English history which exercised an influence on the vocabulary. From what sources are the following words derived? Algebra, dower, palace, clan, dash, bard, buckler, chant, fog.

ARITHMETIC.

Add $^1/_3$, $^1/_5$, $^1/_2$, $^1/_7$, $^1/_{11}$.

Divide $^{12}/_{49}$ by $^3/_7$.

Multiply together the fractions $4\frac{1}{3}$, $2\frac{3}{4}$ and add the result to $4\frac{3}{4} + 3\frac{1}{3}$.

Find the square roots of 196, 88209, 751689, 5625.

Extract the cube roots of 14706125, 149721291, 99252847.

A bankrupt's debts are $2,520 and his assets are $1,890. What can he pay on the dollar?

Divide $837 among three partners, whose shares are to be in the proportion of ½, ⅓ and ⅕.

Multiply 27 acres, 3 roods, 14 perches, by .235.

Write in Roman numerals the year 1903.

Final.

TRIGONOMETRY.

Maximum 150; Minimum 90.

A.

1. Prove tan. $(A - B) = \frac{\text{tan. } A - \text{tan. } B.}{1 + \text{tan. } A. \text{ tan. } B.}$

2. From the top and bottom of a cliff 68 feet high, the depressions of a ship at sea are observed to be 16° 28′ and 14° 21′. What is the horizontal distance in yards from the cliff to the ship?

3. Find the area of a triangle given the three sides, $a = 131$, $b = 246$, $c = 327$.

B.

4. Prove:

$$\sin \frac{a}{2} = \sqrt{\frac{-\cos. \ s \ \cos. \ (s - A)}{\sin. \ B. \ \sin. \ C.}}$$

5. In a right angled spherical triangle the hypotenuse is 75° 20′, and a side is 64° 10′; required the other parts.

Find the three angles of a spherical triangle whose three sides are $a = 33° 4'$, $b = 74° 16'$, $c = 94° 18'$.

GEOMETRY.

Maximum 100; Minimum 50.

1. If from the ends of the side of a triangle there be drawn two straight lines to a point within the triangle, these shall be less than the other two sides of the triangle, but shall contain a greater angle.

2. Bisect a triangle by a line drawn from a given point in one of the sides.

3. Divide a given straight line into two parts so that the rectangle contained by the whole and one of these parts shall be equal to the square on the other part.

4. In any triangle the squares on the two sides are together double of the squares on half the base and on the straight line joining its bisection with the opposite angle.

5. Upon a given straight line to describe a segment of a circle which shall contain an angle equal to a given rectilineal angle.

6. Describe an isosceles triangle having each of the angles at the base double of the vertical angle.

7. Find a fourth proportional to three given straight lines.

8. Describe a rectilineal figure which shall be similar to one, and equal to another rectilineal figure.

MENSURATION.

1. Let AB run north six chains; AD north 80° east; BD south 60° east. Cut off one acre by a line parallel to AB.

2. A rectangular field A B C D measuring fifteen chains by eight chains is bought by three men, who pay respectively $300, $400 and $500. Divide the land among them in that proportion.

3. A tract of land is bounded thus: N. 35¼°, E. 23 chains; N. 75½°, E. 30 chains 50 links; S. 3¼°, E. 46 chains 49 links; N. 66¼°, W. 49 chains 64 links. Divide it into four equivalent parts by two straight lines, one of which is to run parallel to the third side, required the distance of the parallel division line from the first corner, measured on the fourth side, also the bearing of the other division line, and its distance from the same corner measured on the first side.

4. A river 30 feet deep and 200 yards wide is flowing to the sea at the rate of 4 miles an hour. Find how many tons of water run into the sea per minute.

5. A rectangular field is 300 yards long and 200 broad; find the distance from corner to corner. If a belt of trees 30 yards wide be planted round the field, find the area of the interior space.

6. Find area of circular field whose circumference is 50 chains.

SURVEY ACT.

Maximum 150; Minimum 90.

1. Give definition of a single front concession, and state how lines are to be run therein.

2. What is a "double front" concession? When was the system introduced, and how are lines to be run in these concessions?

3. Describe the sectional system of survey. When was it introduced, and how are lines governed therein?

4. What is a "proof line," and when should it be used?

5. How are lines to be run in the districts of Muskoka and Parry Sound?

6. How are lines to be run in the Rainy River District, where the land was surveyed in accordance with the Dominion Lands system?

7. How are lines to be run in townships now being surveyed in New Ontario by the Department of Crown Lands, and what is the system called?

8. How would you proceed to have the governing lines of a township defined by stone or other permanent monuments?

Oral examination required.

PRACTICAL ASTRONOMY.

Maximum 150; Minimum 90.

1. Define the following terms: Zenith, parallels of declination, astronomical time, astronomical day, civil time, civil day.

2. State the several methods for determining the variation of the compass.

3. At noon May 5th the correction of a mean time clock is — 16 min. 47.30 sec.; at noon May 12th it is — 16 min. 13.50 sec.; what is the mean time on May 25th, when the clock face is 11 hr. 3 min. 12.6 sec., supposing the rate to be uniform?

4. On May 2, 1841, in longitude 40° 45′ W., the meridian altitude of the moon's centre was 25° 13′ 46.2″ S., and declination was 8° 26′ 3.8″ S. What was the latitude of the place?

5. At a place in north latitude the declination of the sun was 23° 29′ N., and its true altitude at 8h. 54m. was 48° 42′, and at 9h. 46m. it was 55° 48′. Find the latitude.

6. On the 11th May, 1854, at a place in latitude 28° 30′ 25″, the declination of Castor was 32° 12′ 10.7″ N. Find its meridian altitude.

7. In longitude 25° 17′ E., on March 13, 1856, about 9h. 30m. p.m., time given by a Greenwich chronometer is 7 hr. 51 min. 12.3 sec., which is 3 min. 13.4 sec. slow. What is the local sidereal time?

LEVELLING.

1. What is meant by direct, and by indirect levelling? (a) What is the difference between a vertical and level line?

2. In taking levels, what is the best length of sight (give reasons), and why is it that equal lengths of foresights and backsights are best?

3. Define: levelling, datum level, bench mark, check levels.

4. Describe engineer's Y level, and give its adjustments.

5. Give form of field book and method of keeping notes, in levelling.

6. What is the difference between true and apparent level at the distance of three miles?

MINES AND OTHER ACTS.

1. State the law as to the making and registration of plans of subdivision of land into lots, etc.

2. State the law under the Municipal Act as to roads, as to opening and closing, etc.

3. Give a short statement as to the law re Ditches and Watercourses Act.

4. Ditto re Drainage Act.

5. Ditto re Mining Act as to dimensions of lots, claims, etc., in surveyed and unsurveyed lands, etc.

ALGEBRA.

Maximum 100; Minimum 50.

1. Solve, $2\ (1+x-x^2)+{}^1/_9=\sqrt{1+x-x^2}$.

2. After eight-ninths of a swarm of bees and the square root of half the swarm had flown away, 20 bees remained. How many bees were in the swarm?

3. Two persons, A and B, start from different points and travel towards each other. When they meet A has traveled 30 miles more than B. It would take A 4 days to travel the distance B had come, and B 9 days to travel the distance A had come. How far were they apart when they set out?

4. In an arithmetical progression, given the common difference (d), the first term (a), and the sum of all the terms (s) find the number of terms.

5. Insert four arithmetical means between 1 and — 1.

6. State and prove the rule for finding the sum of an infinite decreasing geometrical progression.

7. A man bought 10 bushels of wheat on condition that he should pay 1 cent for the 1st bushel, 3 cents for the 2nd bushel, 9 cents for the 3rd bushel, and so on, to the last. How much did he pay for 10 bushels?

8. Find the middle term of $(a^n+b^n)^{12}$.

9. Solve $x^2+y=7$.
$y^2+x=11$.

CURVES.

Maximum 50; Minimum 30.

1. Having given the radius of a circular curve show how to find the deflection angle.

2. The deflection angle of a curve is $1\frac{1}{2}°$, find the radius without the use of tables.

3. Why is the method of designating curves by their degree better than designating them by their length of radius?

4. Draw a diagram showing tangents, chords, angles of deflection, and intersection angles, and state the relation between the deflection angle and the central angle.

5. Given the perpendicular distance between two parallel tangents, the distance between the two tangent points and the first radius of a reversed curve uniting the tangents, show how to find the chords and the second radius. Illustrate by a practical example.

GEOLOGY AND MINERALOGY.

1. State the mineral composition of granite and gneiss and how they are distinguished.

2. Give a simple method of determining the principal elements in compound minerals.

3. Explain a method of finding the specific gravity of a solid body, and find the specific gravity of a quartz crystal which weighs 293.7 grains in the air, and in water 180.1 grains.

4. State the difference between travertine and marble, gypsum and calcite, galena and graphite, copper pyrites and iron pyrites, gold and copper pyrites.

5. Explain, by diagram or otherwise, the following terms: Anticlinal, synclinal, uncomformable, stratification, fault, outcrop, fossil, fold, sedimentary deposits, eruptive and metamorphic rocks, structure, veins, country or wall rock, lode, a horse.

6. Give a description of the Carboniferous Age; what plants contributed mostly to the formation of coal? Name the localities in the Dominion of Canada in which coal measures are found.

7. Give a general description of the formation lying between Kingston and Niagara Falls. Show a section as to dip, and plan as to strike of these formations. Name the economic minerals in them.

8. State the theory of the origin of surface soil and the occurrence and extent of boulders in the same. Give the character and composition of the boulders in the vicinity of Toronto.

Give the general characteristics of the Laurentian and Huronian formations.

PRINCIPLES OF EVIDENCE.

1. State the law as to Ontario Land Surveyors taking affidavits as to monuments, etc., and write one.

2. Give the meaning of and state the value of the following kinds of evidence: Direct, indirect, circumstantial, hearsay, traditional, interested, disinterested, documentary of different kinds, relevant, oral.

3. Under what circumstance can oral evidence be taken as to documents?

4. What plans, field notes, etc., can be used as evidence?

5. Under what circumstances will a person's evidence as to corners of his own lot be considered the best evidence?

ELEMENTARY BOTANY AND FLORA.

1. Describe the roots of plants as to their origin, form, position and duration.

2. Describe the stems of plants, as to their class, attitude, texture, position, shape.

3. Describe five principal parts of a flower.

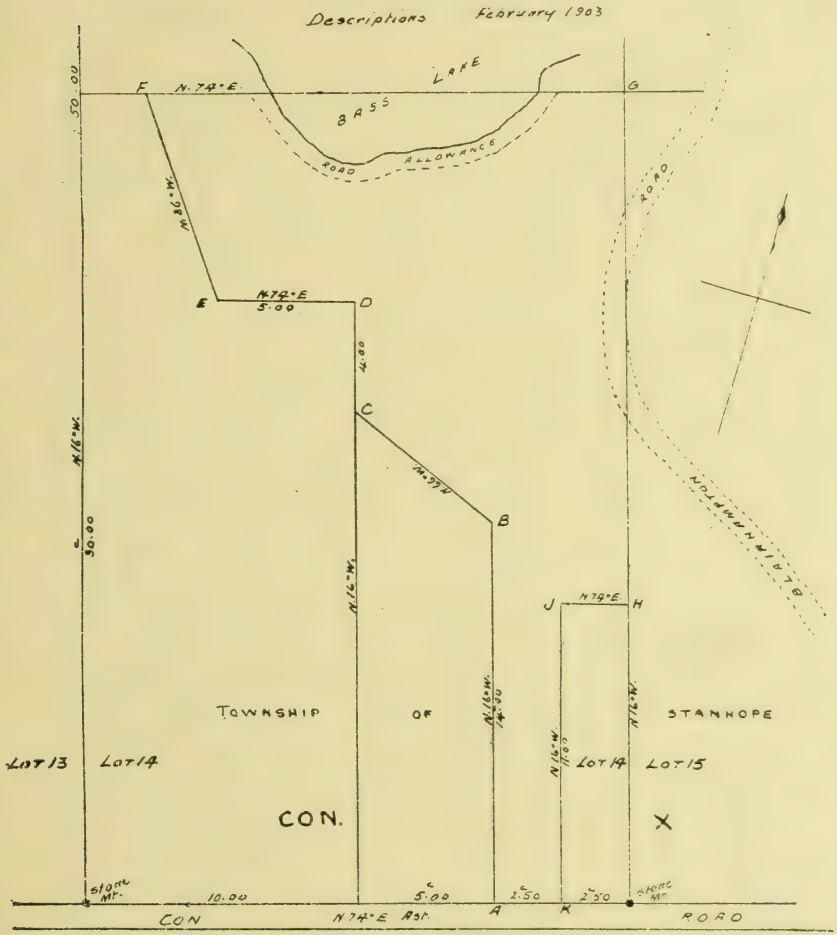
4. State the varieties and economic uses and values of the following trees: Pine, cedar, tamarac, balsam, spruce and hemlock.

5. State the varieties and economic values and uses of the following trees: Oak, elm, maple, ash, birch and beech.

6. How are survey lines marked on trees, and how may the lines be examined as to date of survey, and can it be done in southern as well as in northern climates?

DESCRIPTIONS BY METES AND BOUNDS.

Maximum, 100; Minimum, 75.

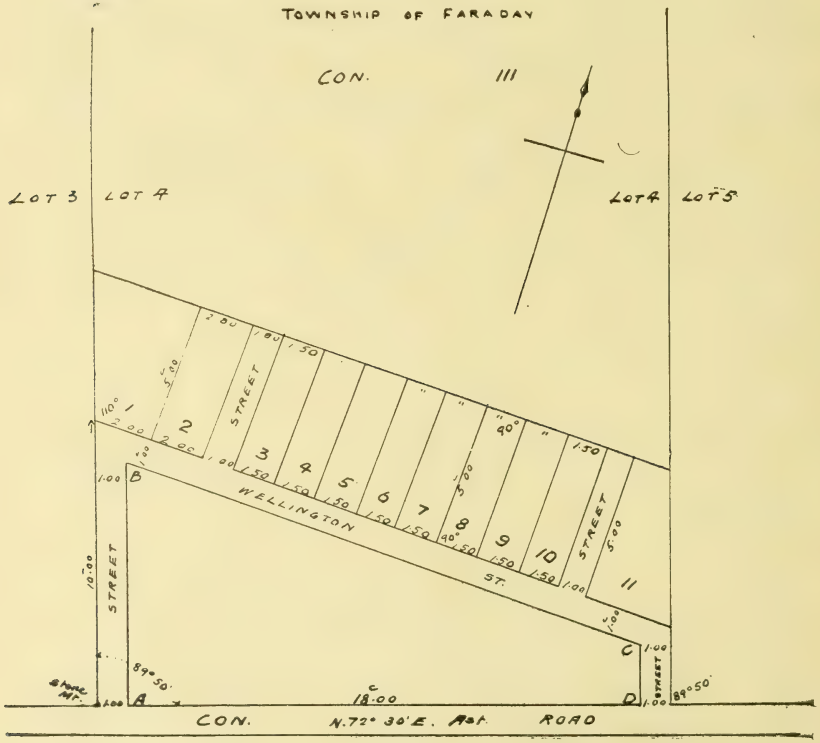


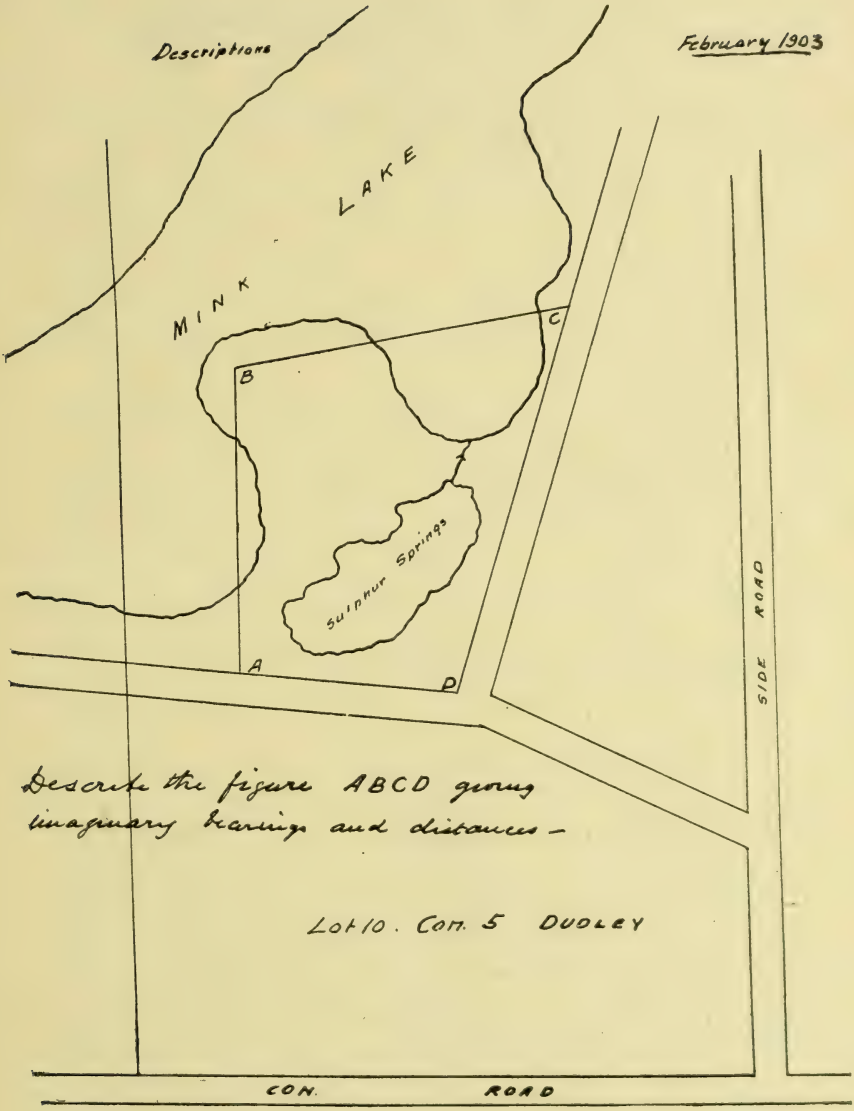
Describe by metes and bounds the figure A B C D E F G H J K. Give distances B C and E F

Descriptions February 1903

2. Describe Lot No 8 by metes and bounds -

3. Describe the piece of land ABCD by metes and bounds. Give distances AB, BC and CD




Descriptions
February 1903
LAKE
MINK
B
C
Sulphur Springs
A
D
SIDE ROAD
Describe the figure ABCD giving imaginary bearings and distances -
Lot 10. Con. 5 DUDLEY
CON.
ROAD

LIST OF MEMBERS.

31st July, 1903,

The names of those members granted exemption by By-laws ratified by the Association are marked *.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Abrey, George Brockitt, Toronto Junction,..10th Jan., 1860
D.L.S.

Allan, John Richard, Renfrew.....6th Nov., 1894
Grad. S.P.S.

Anderson, Wm. Beaumont, Ottawa.....14th Feb., 1903
Grad. R.M.C., B.A. (McGill).

Aylsworth, Charles Fraser, Jr., Madoc.....8th Jan., 1886
D.L.S.

Aylsworth, John Sidney, Selby, P.O. Box 23..9th Jan., 1871
D.L.S.

Aylsworth, William Robert, Belleville,
P.O. Box 2.....8th Nov., 1861
D.L.S.

Baird, Alexander, Leamington.....7th July, 1877
D.L.S., C.E.

Barrett, Russell Henry, Pembroke.....14th Feb., 1903
Grad. S.P.S.

Barrow, Ernest George, Hamilton.....4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.

Bazett, Edward, Burk's Falls... .....8th July, 1881
D.L.S.

Beatty, David, Parry Sound.....12th July, 1869
D.L.S.

Beatty, Herbert John, Eganville.....8th Nov., 1893
Grad. S.P.S.

Beatty, Walter, Delta.....19th July, 1858
D.L.S., M.P.P.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Bell, Andrew, Almonte.....14th Oct., 1901
B.A., M.A., S.C.E., Mem. Can. Soc. C.E., Mem. Ont. A.A., D.L.S., C.E.

Bell, James Anthony, St. Thomas.....11th Oct., 1875
D.L.S., Co. Engineer. Elgin. City Engineer, St. Thomas.

Bigger, Charles Albert, Ottawa, 68 Daly Ave..6th Jan., 1882

Blake, Frank Lever, Meteor'g'l Office, 13th April. 1875
D.L.S.

Bolton, Ellsworth Doan, Listowel.....7th Nov., 1899
B.A.Sc. (McGill).

Bolton, Lewis, Listowel.....9th July, 1864
D.L.S.

Boswell, Elias John, C.P.R. Construction Dept., Offices, Winnipeg..... ....7th Nov., 1896
Grad. S.P.S.

Bowman, Clemens Dersteine, West Montrose. 10th July, 1879

Bowman, Herbert Joseph, Berlin.....7th Jan., 1887
D.L.S., Grad. S.P.S., Treasurer County Waterloo, Assoc. Mem. Can. Soc. C.E.

Bray, Edgar, Oakville.....6th Oct., 1866
D.L.S.

Bray, L. T., Amherstburg.....17th Feb., 1902

Bray, Harry Freeman, Oakville.....10th July, 1882

Bray, Samuel, Ottawa, Dept. of Indian Affairs..6th Jan., 1877
D.L.S., C.E.

Brown, George Laing, Morrisburg.....19th Feb., 1898
Grad. S.P.S.

*Brown, John Smith, (address not known),.....8th July, 1852
D.L.S.

Browne, Harry John, Toronto, 157 Bay St.....6th July, 1872
C.E.

Browne, William Albert, Toronto, 18 Toronto st.....10th April, 1876

Burt, Frederick Percy, New York, N.Y.....8th July, 1885
Manager and Treasurer Engineering News Pub. Co., 220 Broadway, New York.

Butler, Matthew Joseph, Room 51, Street Ry., Chambers, Montreal.....11th Jan., 1878
M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., C.E.

Byrne, Thomas, Sault Ste. Marie.....15th July, 1862
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

*Caddy, Cyprian Francis, Campbellford.....10th July, 1860
D.L.S.

Caddy, John St. Vincent, Ottawa, 559 King st..6th Oct., 1866
D.L.S.

Cameron, Alfred John, Peterborough.....9th April, 1889

Campbell, Archibald William, Toronto,
Parliament Buildings.....10th April, 1885
C. E. Deputy Minister of Public Works.

Carpenter, Henry, Stanley, B.A., Sc.,
(Toronto Univ.), Collingwood.....25th Feb.,1899

Carre, Henry, 276 Albert st., Belleville,
Box 203.....8th Nov., 1861
M.O. & Georgian Bay Canal, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.

*Carroll, Cyrus, Prince Albert, Sask.....10th Jan., 1860
Mem. Can. Soc. C.E., D.L.S.

Casgrain, Joseph Philippe Baby, 180 James st.,
Montreal.....5th Jan., 1887
D.L.S., P.L.S. (Que.), C.E., Assoc. Mem. Can. Soc. C.E., Chief Eng. M. & P.J. Ry.

Cavana, Allan George, Orillia.....8th July, 1876
D.L.S.

Chalmers, John, Port Arthur,
per Ont. & R.R. R'y Co.....14th April, 1896
Grad. S.P.S.

Charlesworth, Lionel Clare, Rat Portage...14th April, 1896
Grad. S.P.S., Agent Bureau of Mines (Ont.).

*Cheesman, Thomas, Mitchell.....11th July, 1856
D.L.S.

Chipman, Willis, Toronto, 103 Bay st.....4th Oct., 1881
B.A.Sc. (McGill), Mem. Am. Soc. C.E.; Mem. Can. Soc. C.E.

Clarke, L. O., London, 291 Simcoe st.....14th Feb., 1903

Code, Abraham Silas, Alvinston.....14th April, 1896

Cozens, Joseph, Sault Ste. Marie.....7th July. 1875
D.L.S.

*Davidson, Alexander, Arkona.....11th Oct., 1858
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Davis, Allan Ross, Molson's B'k Bldgs., Win'g.8th Jan., 1886
B.A.Sc. (McGill).

Davis, John, Alton.....5th April, 1878

Davis, William Mahlon, Berlin.....11th April, 1885
Grad. R.M.Coll. (Kingston), Town Engineer.

Deans, William James, (address not known).11th July, 1884

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dickson, James, Fenelon Falls.....6th April, 1867
D.L.S.

Dixon, Howard, Smith's Falls, Ont.....14th Feb., 1903
Grad. S.P.S.

Dobbie, Thomas William, Tilsonburg.....11th July, 1856
D.L.S.

Dobie, James Samuel, Port Arthur.....21st Feb.,1898
B.A.Sc. (Toronto Univ.).

Doupe, Joseph, Winnipeg, Man.,
169 Edmonton st.....13th Jan., 1863
D.L.S., P.L.S. (Man.), C.E. (McGill), P.L.S. (B.C.).

Ducker, William A., Winnipeg, Man.,
334 Pacific Ave.....6th April, 1882
D.L.S., P.L.S. (Man.), Swamp Lands Com.

Esten, Henry Lionel, Toronto, 157 Bay st...7th Jan., 1887
Evans, John Dunlop, Trenton.....8th July, 1864
D.L.S., Mem. Can. Soc. C.E., Chief Eng. Cent. Ont. Ry.

Fair, John, Brantford.....13th April, 1875

Fairbairn, Richard Purdom, Toronto,
127 Major st.....7th Oct., 1876
Surveyor for Dept. of Pub. Works, Ontario.

Fairchild, Charles Court, Brantford.....9th April, 1894
Grad. S.P.S.

Fairchild, William Howard, Simcoe.....17th Feb., 1900

Farncomb, Alfred Ernest, Regina, N.W.T...9th April, 1895

Farncomb, Frederick William, London,
213 Dundas st.....6th Nov., 1889

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Fawcett, Thomas, Niagara Falls.....6th Jan., 1881
Dom. Topographical Surveyor.

Filmore, S. H., St. Thomas.....17th Feb., 1902

Fitton, Charles Edward, Orillia, Box 142....10th April, 1879
D.L.S.

Flater, Frederick William, Petrolea.....9th April, 1888

Ford, William Butterton, Hamilton,
42 James st. n.....21st Feb., 1898

Francis, John James, Sarnia P.O., Box 304..16th Oct., 1861
D.L.S.

*Fraser, Charles, Wallaceburg.....5th Aug., 1847
D.L.S.

Galbraith, William, Bracebridge.....4th April, 1883
D.L.S.

Gamble, Killaly, Toronto, 88 Charles st.....6th April, 1888
D.L.S., P.L.S. (Man.), Sec. Assoc. O.L.S., Captain R.A. (Ret'd).

Gardiner, Edward, St. Catharines.....6th Jan., 1866
D.L.S.

Gaviller, Maurice, Collingwood, Box 164....6th Jan., 1866
C.E. (McGill), D.L.S.

Gibson, Harold Holmes, Willowdale.....8th Sept., 1891

*Gibson, James Alexander, Oshawa.....7th April, 1855
D.L.S.

Gibson, Peter Silas, Willowdale.....19th July, 1858
C.E.M.S. (Mich. Univ.), D.L.S., Mem. Can. Soc. C.E., Engineer Tp. of York.

Gibson, Wilbert Silas, Willowdale.....21st Feb., 1898

Gillon, Douglas John, Fort Frances.....9th Nov., 1895
Grad. R.I.E. Coll.

Graydon, Aquila Ormsby, London.....8th July, 1880
City Engineer.

Griffin, Albert Dyke, B.A., Woodstock.....11th Nov., 1890

Hanning, Clement George, Preston,
Lock Box 130.....19th July, 1858
D.L.S., C.E. (Trin. Coll., Dublin).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Hart, Milner, Toronto, 103 Bay st.....11th July, 1863
D.L.S.

Harvey, Thomas Alexander,
(address not known).....13th Nov., 1893
C.E. (R.P.I., Troy, N.Y.).

Heaman, John Andrew, G.T.R., Union Station,
Toronto.....16th Nov., 1896

Henry, Frederick, London, Albion Building.7th April, 1887

*Hermon, Royal Wilkinson, Rednersville....13th July, 1857
D.L.S.

Hobson, Joseph, Montreal, G.T.Ry. Office....3rd Oct, 1855
D.L.S., Chief Eng. Grand Trunk Railway System.

Holcroft, H. S., Toronto, 182 Bloor st. w....17th Feb., 1902

Hopkins, Marshall Willard, Hamilton.....13th Nov., 1893
D.L.S, B.A.Sc. (McGill), Assoc. Mem. Can. Soc. C.E., Chief Engineer I.R.R.C.

Hutcheon, James, Guelph.....10th Nov., 1891
Grad. S.P.S., City Engineer.

Irwin, James Moore, Rat Portage.....13th Jan., 1863
D.L.S.

Jackson, John Herbert, Niagara Falls.....16th Feb., 1901

James, Darrell Denman, Toronto,
227 George st.....3rd Nov., 1891
B.A., B.A.Sc. (Toronto Univ.).

James, Silas, Toronto, 227 George st .....19th July, 1858
D.L.S.

Jones, Charles Albert, Petrolea.....8th April, 1881
D.L.S.

Jones, John Henry, Sarnia, Box 194.....10th Oct., 1886
D.L.S.

Jones, Thomas Henry, Brantford.....10th Oct., 1878
B.A.Sc. (McGill), D.L.S., City Engineer.

*Keefer, Thomas Coltrin, Ottawa.....14th Aug., 1840
D.L.S., C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Kirkpatrick, George Brownly, Toronto, Dept. of Crown Lands.....13th April, 1863
D.L.S., Director of Surveys.

Laird, James Stewart, Essex.....6th April, 1867
D.L.S.

Laird, Robert, Sudbury.....11th Nov., 1887
Grad. S.P.S.

Lewis, John Bower, Ottawa, Brunswick House.....4th Oct., 1883
D.L.S., P.L.S. (Quebec), C.E.

Lougheed, Aaron, Port Arthur.....12th Nov., 1888
D.L.S.

Low, Edward Hamilton, Port Dover.....17th Feb., 1902
R.M.C.

*Low, Nathaniel Edward, Wiarton.....11th July, 1856
D.L.S.

Lumsden, Hugh David, Toronto, 63 Homewood Ave.....4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.

Macdougall, Allan Hay, Port Arthur.....11th April, 1859
D.L.S., Town Engineer.

MacKay, James John, Hamilton.....25th Feb., 1899

MacKenzie, William, Sarnia.....11th April, 1896
Grad. R.M.C. (Kingston).

MacKenzie, William Lyon, Cranbrook, B.C..7th April, 1887
C.E.

McAree, John, Toronto.....6th April, 1867
Dominion Topographical Surveyor, B.A.Sc. (Toronto Univ.).

McCubbin, George Albert, St. Thomas, City Engineer's Office.....9th Nov., 1895
Assistant City Engineer.

McDonell, Augustine, Chatham, 4 and 5 Ebert's Block.....11th July, 1863
D.L.S.

McDowall, Robert, Owen Sound.....11th Nov., 1890
Grad. S.P.S., Town Engineer.

McEvoy, Henry Robinson, St. Marys.....10th July, 1873
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

McFadden, Moses, Neepawa, Man.....13th April, 1858
D.L.S., P.L.S. (Man.).

McFarlen, George Walter, Toronto, City Hall,
Assistant City Engineer's Office.....11th Nov., 1889
Grad. S.P.S.

McGeorge, William Graham, Chatham,
Box 225.....8th Jan., 1866
D.L.S.

McGrandle, Hugh, Huntsville.....5th Jan., 1883
D.L.S.

McKay, Owen, Windsor, P.O. Box 167.....7th Jan., 1887
Grad. S.P.S., Chief Eng. L. & L.E. Ry.

McKenna, John Joseph, Dublin.....9th July, 1860
D.L.S.

McLatchie, John, Nelson, B.C., P.O.Box 128..9th Jan., 1864
D.L.S., P.L.S. (Que., Man. and B.C.).

McLean, James Keachie, Elora.....8th April, 1876
D.L.S.

McLean, William Arthur, Toronto,
Parliament Buildings.....21st Feb., 1898
Secretary of Roads.

McLennan, Murdoch John, Williamstown...13th Nov., 1893
B.A.Sc. (McGill), D.L.S.

McLennan, Roderick, Toronto,
115 Avenue Rd.....20th June, 1846
D.L.S.

McNab, John Duncan, Chatham.....9th Oct., 1879

McNaughton, Finlay Donald, Cornwall.....25th Feb., 1899

McPherson, Archibald John, Brockville....10th April, 1897
B.A.Sc. (Toronto Univ.).

McPherson, Charles Wilfrid, Dawson, N.W.T.
care of Dep't. of Interior.....21st Feb., 1899

McPhillips, George, Winnipeg, Man.....9th July, 1885
D.L.S., P.L.S. (Man.).

Manigault, William Mazyck, Strathroy,
P.O. Box 300.....8th July, 1876
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Marshall, James, Holyrood.....6th Oct., 1866
D.L.S.

Meadows, William Walter, Windsor.....21st Feb., 1898
Grad. S.P.S.

Miles, Charles Falconer, 268 Triangle st.,
Buffalo, N.Y.....13th Jan., 1862
D.L.S.

Miller, Frederick Fraser, Napanee.....8th Jan., 1885

Moore, John MacKenzie, London,
Albion Building.....9th Oct., 1879

Moore, John Harrison, Smith's Falls.....11th Nov., 1889
Grad. S.P.S.

Morris, Alfred Edmund, Perth.....10th April, 1879

Morris, James Lewis, Pembroke.....7th July, 1886
D.L.S., C.E. (Toronto Univ.).

Mountain, George Alphonse, Ottawa.....9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.), Chief Eng. Can. Atlantic and O.A. & B. Ry.

Murdoch, William, Toronto, 37 Bloor st. e..10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto, 157 Bay st.6th Oct., 1886

Nash, Thomas Webb, Kingston.....7th April, 1854

Newman, John James, Windsor.....21st Feb., 1898

Newman, William, Windsor,
57 Sandwich st. w.....12th Nov., 1892
Grad. S.P.S.

Niven, Alexander, Haliburton.....8th July, 1859
D.L.S.

Ogilvie, William, Dawson City, Yukon Dist..12th July, 1869
D.L.S., Commissioner for Yukon District.

O'Hara, Walter Francis, Chatham.....14th April, 1892
D.L.S.

Patten, Thaddeus James, Little Current.....5th Jan., 1883
D.L.S.

Peterson, Peter Alexander, Montreal, P.Q...16th July, 1863
D.L.S., C.E., Mem. Can. Soc. C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Pinhey, Charles Herbert, Ottawa, 552 Gilmour st.....12th Nov., 1888
D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

Proudfoot, Hume Blake, Port Arthur.....6th Jan., 1882
D.L.S., C.E. (Toronto Univ.)

Rainboth, Edward Joseph, Ottawa.....11th Nov., 1887
D.L.S.

Rainboth, George Charles, Aylmer, P.Q....11th July, 1868
D.L.S., P.L.S. (Que.).

Reynolds, Samuel Henry, (address not known).....17th July, 1880

Roberts, Vaughan Maurice, St. Catharines..5th April, 1887

Robertson, James, Glencoe.....11th July, 1885
Grad. S.P.S.

Robinson, Franklin Joseph, Macleod, Alta..21st Feb., 1898
Grad. S.P.S.

Roger, John Mitchell, (address not known).10th Nov., 1888
Grad. S.P.S.

*Rombough, Wm. R., Toronto, 61 Walton st.14th Nov., 1848
D.L.S.

Rorke, Louis Valentine, Sudbury.....14th April, 1890
D.L.S.

Ross, George, Welland.....10th July, 1879
B.A.Sc. (McGill), D.L.S.

*Rubidge, Tom S., Cornwall.....9th Feb., 1849
D.L.S., Asst. Eng. Dept. Rys. and Canals.

Russell, Alexander Lord, Port Arthur.....16th April, 1873
D.L.S., P.L.S. (Que.).

Sankey, Villiers, Toronto, City Hall.....11th Jan., 1878
D.L.S., City Surveyor.

Saunders, Bryce Johnston, Regina, N.W.T...7th Jan., 1885
B.A.Sc. (McGill), D.L.S., Deputy Min. Pub. Works.

Scane, Thomas, Ridgetown.....7th Jan., 1865
D.L.S.

*Schofield, Milton C., 185 14th st., Buffalo, N.Y.....28th Sept., 1843
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Schwitzer, John Edward, (address not known) .....16th Nov., 1896
Town Engineer, B.A.Sc. (McGill).

Seager, Edmund, Rat Portage.....8th July, 1861
D.L.S.

Selby, Henry Walter, Dinorwic, Dist. of Rainy River.....8th Jan., 1876
D.L.S.

Sewell, Henry DeQuincy, Toronto, 29 St. Mary st.....9th July, 1885
D.L.S., A.M.I.C.E.

Shaw, John Henry, Pembroke.....17th Feb., 1900
Grad. S.P.S.

Silvester, George Ernest, Sudbury.....12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Toronto, Room 71, Confederation Life Building.....9th Jan., 1879
D.L.S., C.E., Public Works Dept.

Smith, Angus, Stratford.....14th April, 1896
Grad. S.P.S., City Engineer.

Smith, George, Woodville, P.O. Box 77.....7th April, 1881
Engineer for Co. Victoria and four Townships.

Smith, Henry, Toronto, Crown Lands Dept..8th Nov., 1861
D.L.S., Mem. Can. Soc. C.E.

Speight, Thomas Bailey, Toronto, 405 Temple Building.....6th Jan., 1882
D.L.S.

Squire, Richard Herbert, Brantford, 103 Dalhousie st.....14th April, 1896
B.A.Sc. (Toronto Univ.).

Steele, Edward Charles, Sault Ste. Marie, Box 309.....9th April, 1889
Assoc. Mem. Can. Soc. C.E.

Stewart, Elihu, Ottawa, Dept, of the Int....8th April, 1872
D.L.S., Chief Inspector of Timber and Forestry.

*Stewart, George Alexander, Calgary, Alta...8th July, 1852
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Stewart, John, (address not known).....11th Nov., 1887
D.L.S.

Stewart, Walter Edgar, Aylmer.....12th April, 1892

*Strange, Henry, Rockwood.....30th Nov., 1838
D.L.S., C.E.

Stull, William Walter, Sudbury.....17th Feb., 1900
B.A.Sc. (Toronto Univ.).

Traynor, Isaac, Dundalk.....16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man.,
C.P.R., Eng. Office.....6th July, 1878
D.L.S., C.E. (Toronto Univ.).

Tyrrell, James Williams, Hamilton,
42 James st. n.....8th April, 1885
C.E. (Toronto Univ.), D.L.S., Co. Eng. for Wentworth.

*Unwin, Charles, Toronto, 126 Seaton st....12th April, 1852
D.L.S.

Ure, Frederick John, Woodstock.....7th April, 1887
C.E.

Van Buskirk, William Fraser, Rossland, B.C..7th April, 1883
Grad. R.M. Coll. (Kingston), City Engineer.

Van Nostrand, Arthur J., Toronto,
405 Temple Building.....30th Oct., 1882
D.L.S.

Wadsworth, Vernon Bayley, Toronto,
103 Bay st.....9th April, 1864
D.L.S.

Walker, Alfred Paverly, Toronto, Room 508,
Union Station, C.P.Ry., Eng. Office.....6th Jan., 1882
D.L.S., Mem Can. Soc. C.E.

Wallace, James Nevin, Calgary, Alta.....21st Feb., 1898
B.A., B.E. (Trin. Coll. Dublin).

Ward, Archeson Thomas,
Wabigoon, Dist. of Rainy River.....10th April, 1897

Warren, James, Walkerton, P.O. Box 190....7th Oct., 1864
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Watson, John McCormack, Orillia, P.O. Box 224.....13th April, 1892

*Weatherald, Thomas, Goderich, P.O. Box 273.....12th Jan., 1856
D.L.S., C.E.

Weekes, Abel Seneca, Glencoe.....12th April, 1890
D.L.S.

Weekes, Melville Bell, Brantford.....17th Feb., 1900
B.A.Sc. (Toronto Univ.).

West, Robert Francis, Orangeville.....7th April, 1881

Wheelock, Charles Richard, Orangeville.....7th Jan., 1886
Treasurer County of Dufferin.

Whitson, James Francis, Toronto, Crown Lands Dept.....9th Jan., 1886

Wicksteed, Henry King, Cobourg.....7th Jan., 1886
D.L.S., C.E.

Wiggins, Thomas Henry, Finch, Ont.....10th Nov., 1891
Grad. S.P.S., D.L.S., Town Engineer.

Wilde, John Absalom, Sault Ste. Marie.....9th April, 1889

Wilkie, Edward Thomson, Carleton Place...11th April, 1891
D.L.S.

Wilkins, Fred. W., Norwood, Ont., ...6th Jan., 1877

Williams, David, 220 Queen st., Kingston...9th April, 1864
D.L.S.

*Winter, Henry, Thornyhurst.....11th July, 1853
D.L.S., C.E.

*Wood, Henry O., Billings Bridge.....10th Oct., 1855
D.L.S.

*Yarnold, William Edward, Port Perry, P.O. Box 44.....7th April, 1854
D.L.S.

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked *; and under By-law No. 45 are marked †.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Anderson, John Drummond, Trail, B.C.....13th April, 1892

Apsey, John Fletcher, Cumberland, Md.....6th Jan., 1886
Grad. S.P.S.

Aylsworth, Charles Fraser, Sr., Madoc.....2nd April, 1861
D.L.S.

Bell, Andrew, Almonte.....6th Oct., 1866
D.L.S.

Booth, Charles Edward Stewart,
Westmount, P.Q.....6th April, 1882

Bowman, Arthur Meyer, Mahan,
Beaver Co., Pa.....11th Nov., 1887
Grad. S.P.S., Staff of U.S. Engineers.

Bowman, Franklin Meyer, Bellevue,
Allegheny Co., Pa.....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., P.O. Box 815..15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C.....8th July, 1861
P.L.S. (B.C.).

Carbert, J. Alfred, St. Joseph, Mich.....7th April, 1876
D.L.S., Staff of U.S. Engineers.

Coleman, Richard Herbert, Toronto, Canada
Co. Offices, Imperial Bank Chambers....6th Oct., 1877

Deacon, Thomas Russ, Winnipeg.....12th Nov., 1892
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Drewry, William Stewart, Ottawa,
Dept. of the Interior.....5th April, 1883
D.L.S.

Edwards, George, Thurso, P.Q.....6th Jan., 1866
D.L.S.

*Ellis, Henry Disney, Kuching, Sarawak,
Borneo.....7th April, 1877
D.L.S., Commissioner of Pub. Works and Surveys.

Galbraith, John, Toronto,
School of Prac. Science.....13th April, 1875
M.A., D.L.S., Prof. Engineering S.P.S.

Gibbons, James, Ottawa, Dept. of the Int...15th April, 1890
Grad. S.P.S., Dominion Topographical Surveyor.

Gibson, George, St. Catharines.....10th April, 1860
D.L.S.

*Gilmour, Robert, Toronto, care of Western
Loan Company.....11th April, 1856
D.L.S., C.E.

Green, Thomas Daniel, Dawson City.....7th Jan., 1885
D.L.S.

*Harris, John Walter, Winnipeg, Man.....6th Oct., 1866
P.L.S. (Man.), D.L.S., Assessment Com.

Henderson, Eder Eli, Henderson P.O., Maine.7th April, 1887
Grad. S.P.S.

Hermon, Ernest Bolton, Vancouver, B.C....7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Innes, William Livingstone, Simcoe.....14th April 1892
C.E. (Toronto Univ.).

Jephson, Richard Jermy, Calgary, Alta.....7th April, 1877
P.L.S. (B.C.), D.L.S.

Johnson, Sydney Munnings, Greenwood, B.C..9th Nov., 1895

Johnston, Robert Thornton, New York, N.Y.,
(address not known).....9th April, 1889

Kennedy, James Henry, Grand Forks, B.C...7th April, 1887
C.E. (Toronto Univ.), Mem. Can. Soc. C.E., Eng. of V.V. & E. Ry.

Kirk, John Albert, Revelstoke, B.C.....6th July, 1877
D.L.S., P.L.S. (B.C.).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

*Kippax, Hargreaves, Huron, South Dakota..7th July, 1877
C.E. (Toronto Univ.), Assistant to Surveyor-General.

Klotz, Otto Julius, Ottawa, 437 Albert st.....6th Jan., 1876
C.E. (Mich Univ.), Dominion Topographical Surveyor.

Lane, Andrew, Sparrow's Point, Md.....4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

Lendrum, Robert Watt, South Edmonton, Alta.....8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm, (address not known).....10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa, 340 Cooper st.....11th Oct., 1856
D.L.S., C.E.

McCulloch, Andrew, Lake Nelson, B.C.....
Grad. S.P.S., Assoc. Mem. Can. Soc. C.E., City Engineer.

*McMullen, William Ernest, St. John, N.B..11th Nov., 1892
Asst. Eng. C.P. Ry.

MacPherson, Duncan, Montreal.....
Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. East Div. C.P.R.

Magrath, Charles Alexander, Lethbridge, Alta. 1st Nov., 1881
B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).

Moore, Thos. Alexander, London South....12th Nov., 1892

Munro, John Vicar, New York, N.Y., 359 West 31st st.....9th April, 1895

†Paterson, James, (address not known).....5th April, 1878
C.E., Mem. Can. Soc. C.E.

Pearce, William, Calgary, Alta.....12th Oct., 1872
D.L.S., P.L.S. (B.C.).

Ponton, Archibald William, Ottawa, Dept. of Interior.....9th April, 1880
D.L.S.

Pope, Robert Tyndall,——Ireland.....13th April, 1875
D.L.S., C.E.

Purvis, Frank, Mesa City, Arizona.....7th April, 1875

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Reid, John Lestock, Prince Albert, Sask.....8th April, 1870
D.L.S.

Reiffenstein, James Henry, Ottawa,
Dept. of the Interior.....16th April, 1873
D.L.S.

Reilly, William Robinson, London,
361 Simcoe st.....7th April, 1881
D.L.S., P.L.S. (Man.).

Reinhardt, Carl, Montreal,
529 City Hall Ave.....25th Feb., 1899
B.A.Sc. (McGill).

Ritchie, Nelson Thomas, Kipiegan, Man....9th Nov., 1888

Rogers, Richard Birdsall, Peterborough.....9th Jan., 1879
B.A.Sc. (McGill), D.L.S.

*Ross, Joseph Edmund, New Westminster,
B.C.....11th Nov., 1890
P.L.S. (B.C.).

Sanderson, Daniel Leavens, Coral, Mich.....4th Oct., 1882

Shaw, Charles Aeneas, Greenwood, B.C.....6th Oct., 1877
P.L.S. (B.C.).

Sherman, Ruyter Stinson,
(address not known).....12th April, 1890
P.L.S. (B.C.).

Simpson, George Albert, Winnipeg, Man....7th Oct., 1864
C.E., D.L.S., M.P.

Spry, William, Toronto.....19th July, 1858
D.L.S., C.E.

*Stewart, Louis Beaufort, Toronto,
School of Prac. Science.....6th April, 1882
Dominion Topographical Surveyor, Lect. in Surveying.

Strathern, John, (address not known).....5th Oct., 1876
P.L.S. (B.C.), D.L.S.

*Taylor, William Verner, Gananoque.....7th Nov., 1896
Grad. S.P.S.

Tracey, Thomas Henry, Vancouver, B.C....8th April, 1870
C.E., P.L.S. (B.C.), D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Vicars, John Richard Odlum, Kamloops, B.C. . 5th Jan., 1887
D.L.S., P.L.S. (B.C.).

Wallace, Charles Hugh, 36 Dame st., Dublin, Ireland . . . . . 9th Nov., 1889
C.E. (Trin. College, Dublin), Dom. Gov. Surveyor.

Wheeler, Arthur Oliver, (address not known) . . 8th July, 1881
P.L.S. (B.C.), D.L.S.

Wilson, Alfred, Toronto, Can. Co. Offices, Imperial Bank Chambers . . . . . 6th Oct., 1866
D.L.S., Commissioner Canada Company.

SUMMARY.

Active members subject to dues	203
Active members exempted from dues	19
Withdrawn from practice (including 8 Associates)	66
Dead	34
Total number enrolled since incorporation	322

Deceased Members.

NAME.	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Bolger, Francis	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bolger, Thomas Oliver	Kingston	6th July, 1865	1892	—— ——
Bolton, Jesse Nunn	Toronto	6th April, 1867		—— ——, 1901.
Bowman, Leander Meyer	Toronto	14th April, 1892	1892	20th September, 1895.
Brown, David Rose	Cornwall	10th October, 1850	1892	14th May, 1900.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1897.
Caddy, Edward C	Cobourg	18th December, 1846	1892	26th September, 1897.
Coad, Richard	Glencoe	8th October, 1879	1882	17th May, 1897.
Creswicke, Henry	Barrie	8th July, 1864	1892	22nd January, 1898.
Cromwell, Joseph M. O	Perth	1st October, 1846	1892	19th October, 1897.
Davidson, Walter Stanley	Sarnia	9th April, 1884	1882	December, 1900.
Deane, Michael	Windsor	26th May, 1848	19th December, 1882	3rd April, 1887.
DeGurse, Joseph	Windsor	5th April, 1883	1892	22nd March, 1898.
FitzGerald, James William	Peterborough	13th July, 1857	1892	—— ——, 1901.
Foster, Frederick Lucas	Toronto	9th April, 1863	1892	27th July, 1899.
Fowlie, Albert	Orillia	13th January, 1863	1892	—— April, 1898.
Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Gilliland, Thomas Brown	Eugenia	11th July, 1868	25th January, 1890	14th December, 1893.
Haskins, William	Hamilton	5th July, 1855	1892	5th July, 1896.
Hewson, Thomas Ringwood	Hamilton	6th July, 1877	1892	21st October, 1898.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896.
Kains, Tom	Victoria	11th July, 1873		—— ——, 1901.
Kirk, Joseph Green	Stratford	16th February, 1843	1892	22nd January, 1900.
Lynch-Staunton, Francis H.	Hamilton	11th October, 1856	1892	11th June, 1899.
MacMillan, James Alexander	Calgary	6th January, 1877	24th December, 1894	—— ——, 1898.
MacNab, John Chisholm	Hamilton	8th January, 1880	1892	16th October, 1897.
McCallum, James	Fort Francis	30th March, 1849	1892	—— July, 1900.
Malcolm, Sherman Morgan	Blenheim	11th October, 1858	1892	13th January, 1899.
Ogilvie, John Henry	Rat Portage	8th April, 1876	24th April, 1894	21st September, 1898.
Pedder, James Robert	Doon	10th November, 1891	23rd December, 1892	17th January, 1897.
Reid, James Hales	Bowmanville	6th October, 1866	1892	22nd December, 1899.
Robinson, William	London	—— May, 1846	1892	11th October, 1894.
Tiernan, Joseph Martin	Tilbury Centre	7th January, 1886	1892	December, 1900.
Thomas, Augustus Clifford	Chicago	14th January, 1861	1892	—— December, 1896.
Wagner, William	Ossowo	13th April, 1858		—— ——, 1901.
Walsh, Thomas William	Simcoe	25th April, 1842	1892	14th March, 1895.
Wheelock, Charles John	Orangeville	——— ———, 1856	1892	4th July, 1897.

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No. 18.

ANNUAL REPORT

OF THE

ASSOCIATION

OF

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AND

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AT THE

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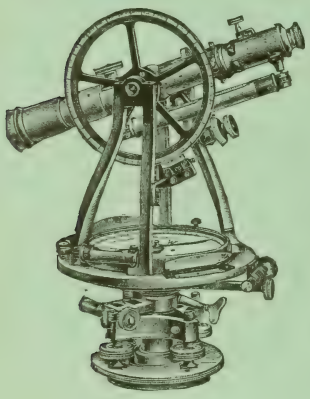

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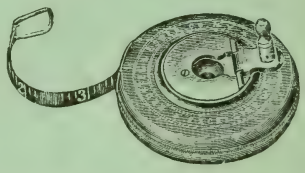

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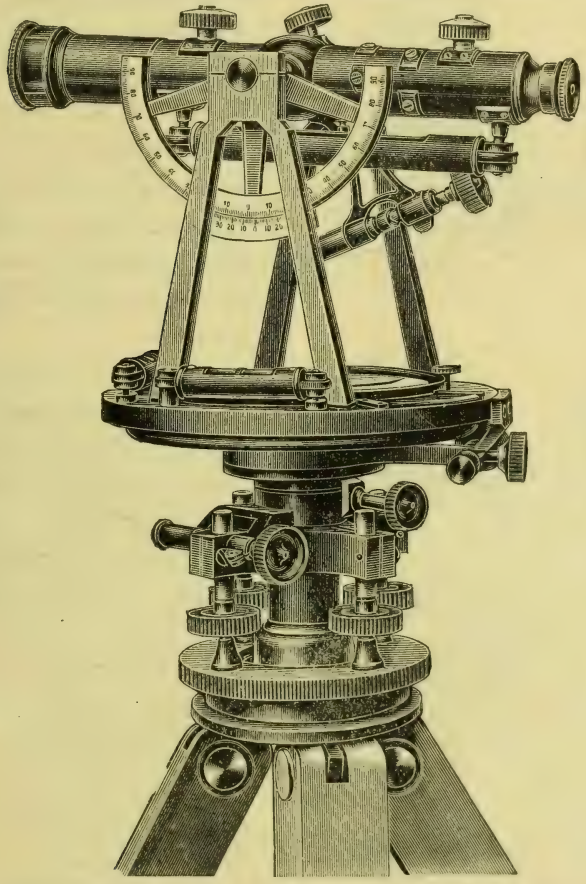

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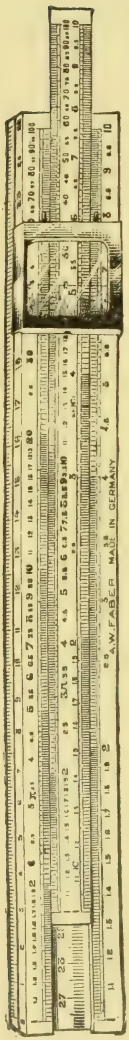

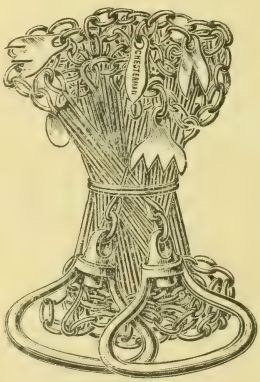

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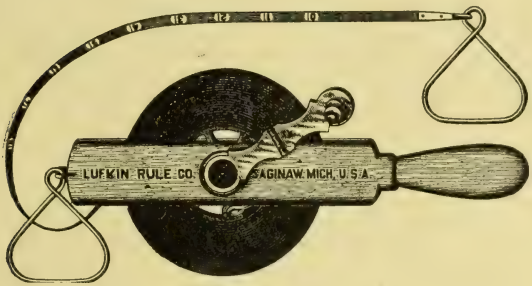

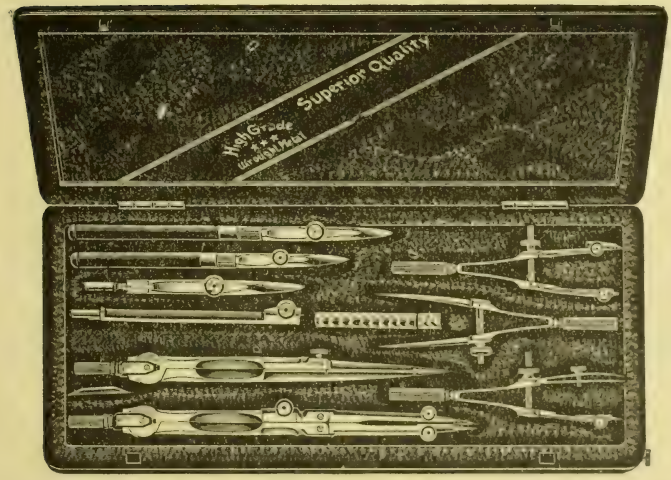

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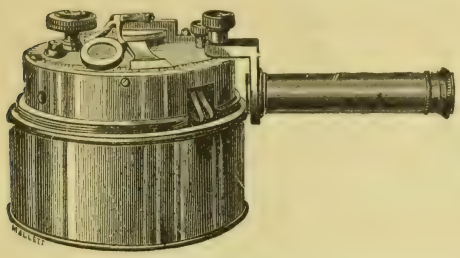

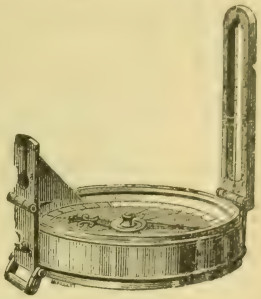

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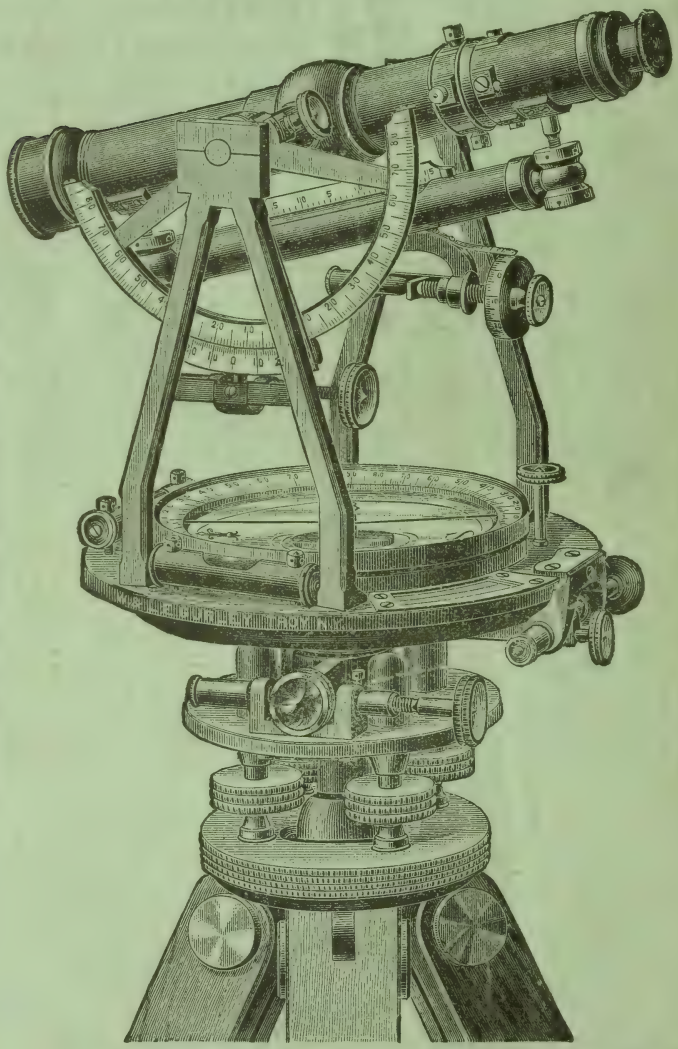

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